Paper No. 45

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte KUNIHIKO YOSHIDA,
TOMIO MIMURA,
SHIGERU SHIMOJO,
MUTSUNORI KARASAKI,
MASAKI IIJIMA,
and
SHIGEAKI MITSUOKA

_____

Appeal No. 1998-1278
Application No. 08/603,186

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ON BRIEF

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Before GARRIS, PAK, and PAWLIKOWSKI, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the examiner's refusal to allow claims 1, 4 through 10 and 12 through 19, which are all the claims pending in the above-identified application. Subsequent to the final Office action

dated October 21, 1996, claims 1 and 10 were amended and claims 3 and 11 were cancelled. See the Brief, page 2.

According to appellants (Brief, page 4), the claims on appeal do not stand or fall together. However, the appellants have presented no substantive arguments as to why the subject matter recited in the dependent claims on appeal is separately patentable over the applied prior art references consistent with the requirements set forth in 37 CFR § 1.192(c)(8)(1997). See the Brief and the Reply Brief in their entirety. A mere reiteration of various limitations in the dependent appealed claims at pages 4 and 5 of the Brief does not satisfy such requirements. *See* 37 CFR § 1.192(c)(8)(1997). Therefore, for purposes of this appeal, we only need to consider claims 1 and 10 in determining the propriety of the examiner's rejections consistent with 37 CFR § 1.192(c)(7)(1999). Claims 1 and 10 are reproduced below:[1]

> 1. A process for removing carbon dioxide from a combustion gas which comprises:
>
> in an apparatus made from carbon steel, bringing a combustion gas which contains oxygen gas and carbon dioxide into contact with a carbon dioxide absorbent solution, at the atmospheric pressure,

[1] A correct version of claim 1 appears in the Amendment dated Feb. 21, 1997, Paper No. 35.

allowing the carbon dioxide absorbent solution to absorb carbon dioxide from the combustion gas, and in the ensuing step,

heating the absorbent solution that has absorbed carbon dioxide, to liberate carbon dioxide and regenerate the carbon dioxide absorbent solution, and

circulating the regenerated solution for reuse,

said carbon dioxide absorbent solution consisting essentially of an aqueous hindered amine solution wherein said hindered amine which contains an alcoholic hydroxyl group in the molecule and is an amine compound selected from a group consisting of

(A) compounds having a primary amino group being bound to a tertiary carbon atom having two unsubstituted alkyl groups;

(B) compounds having a secondary amino group having an N atom bound to a group which is a chain of two more atoms including the binding carbon atom and an unsubstituted alkyl group which contains three or fewer carbon atoms; and

(C) compounds having a tertiary amino group, at least two groups bound to the tertiary amino group, each having a chain of two or more carbon atoms including the binding carbon atom, two of groups bound to the tertiary amino group, being unsubstituted alkyl groups;

provided that compounds having two or more amino groups are excluded and cupric carbonate is added to said carbon dioxide absorbent solution.

10. A process for reducing the corrosion rate of carbon steel from a carbon dioxide absorbent solution employed in a process for removing carbon dioxide from a combustion gas which comprises: in an apparatus made from carbon steel, bringing the combustion gas containing oxygen and gas carbon dioxide

into contact with a carbon dioxide absorbent solution at the atmospheric pressure, allowing the carbon dioxide absorbent solution to absorb carbon dioxide from the combustion gas, and, in the ensuing step,

heating the absorbent solution that has absorbed carbon dioxide, to liberate carbon dioxide and regenerate the carbon dioxide absorbent solution, and

circulating the regenerated solution for reuse, said carbon dioxide absorbent solution consisting essentially of an aqueous hindered amine solution; wherein said hindered amine contains an alcoholic hydroxyl group in the molecule and is an amine compound selected from a group consisting of

(A) compounds having a primary amino group being bound to a tertiary carbon atom having two unsubstituted alkyl groups,

(B) compounds having a secondary amino group having an N atom bound to a group which is a chain of two or more carbon atoms including the binding carbon atom and an unsubstituted alkyl group which contains three or fewer carbon atoms; and

(C) compounds having a tertiary amino group, at least two groups bound to the tertiary amino group, each having a chain of two or more carbon atoms including the binding carbon atom, two of the groups bound to the tertiary amino group, being unsubstituted alkyl groups;

provided that compounds having two or more amino groups are excluded and cupric carbonate is added to said carbon dioxide absorbent solution.

The prior art references relied upon by the examiner are:

Butwell	4,079,117	Mar. 14, 1978
Sartori et al. (Sartori)	4,217,236	Aug. 12, 1980
Pearce	4,440,731	Apr. 3, 1984
Lam et al. (Lam)	4,729,883	Mar. 8, 1988

Foroulis EP 0 102 712 A1 Mar. 14, 1984
(Published European Patent Application)

Claims 1, 4 through 10 and 12 through 19 stand rejected under 35 U.S.C. § 103 as unpatentable over the combined disclosures of Pearce, Sartori, Lam and Foroulis.

Claims 1, 4 through 10 and 12 through 19 stand rejected under 35 U.S.C. § 103 as unpatentable over the combined disclosures of Pearce, Sartori, Lam and Butwell.

We have carefully reviewed the claims, specification and applied prior art, including all of the arguments and evidence advanced by both the examiner and the appellants in support of their respective positions. This review leads us to conclude that the examiner's Section 103 rejections are well founded. Accordingly, we will sustain the examiner's Section 103 rejections. Our reasons for this determination follow.

We find that Pearce teaches employing copper carbonate with or without an additional 50 to 2000 ppm of one or more specific compounds to reduce corrosion of the ***metal*** in contact with an absorbent and to reduce degradation of the absorbent under the conditions of use

> [i]n a [conventional] process for removing carbon dioxide (CO_2) from industrial combustion gases containing the CO_2 and O_2 contacting the gas, in a gas-liquid contactor,

> with an aqueous solution which contains an alkanol amine absorbent-reactant; circulating the solution from the contactor to a regeneration step wherein the CO_2 is released from the absorbent, the CO_2 recovered and the essentially CO_2 free absorbent recycled to the contactor . . . . [See column 4, lines 54-68, together with column 2, lines 10-37 and column 2, line 66 to column 3, line 14.]

Any absorbents, including "monoethanolamine (MEA), diethanolamine (DEA), triethanolamine (TEA), methyl diethanolamine (MDEA), sulfolane, diisopropylamine (DIPA) and the like," may be employed. See column 2, lines 19-50. We recognize that Pearce does not specifically mention using the claimed sterically hindered amine as an absorbent for removing carbon dioxide from the industrial gases.

However, the examiner finds that both Sartori and Lam teach using an absorbent containing the claimed hindered amines useful for absorbing carbon dioxide. See the Answer, pages 6 and 11. We find that Sartori, for example, teaches (column 3, lines 32-39 together with columns 1 and 2 and column 3, lines 48-57) that:

> In copending U.S. application Ser. No. 590,427, filed June 26, 1975, the disclosure of which is incorporated herein by reference, there is disclosed and claimed sterically hindered amine compositions useful for scrubbing acid gases. These sterically hindered amines, unexpectedly improve the efficiency, effectiveness and working

> capacity of the acid gas scrubbing processes [employing conventional amine absorbents, such as MEA and DEA] in all three of the above-mentioned process categories.

We find that Sartori also teaches using a mixture of sterically hindered amines and tertiary amines to further improve the working capacity of the acid gas scrubbing process. See column 3, lines 58-68. According to Sartori (column 6, lines 37- 39), the most preferred hindered amines include 2-amino-2-methyl-1-propanol. Compare Sartori, column 6, lines 37-39 with claims 4, 7, 12 and 15. The other hindered amines specifically described include 2-diethylamino ethanol and 2-dimethylamino ethanol. Compare Sartori, column 9 with claims 5, 6, 9, 14 and 17. The above-mentioned absorbents can be used together with, *inter alia*, corrosion inhibitors and can be regenerated (release CO_2) and reused in an absorber. See column 10, lines 19-26, together with columns 5 and 6.

Given these teachings, we determine that one of ordinary skill in the art would have been led to employ the claimed hindered amines alone or together with a tertiary amine as an absorbent in the acid purification (carbon dioxide removal) process described in Pearce, motivated by a reasonable expectation of successfully improving its efficiency,

effectiveness and working capacity. The phrase "an absorbent solution consisting essentially of an aqueous hindered amine solution" in claims 1 and 10 does not preclude the presence of the tertiary amine in the claimed absorbent solution. The appellants have not demonstrated that the basic and novel characteristics of their invention would be materially affected by the presence of the tertiary amine in the claimed absorbent solution. *See, e.g., In re De Lajarte*, 337 F.2d 870, 874, 143 USPQ 256, 258 (CCPA 1964).

The appellants argue that Pearce does not specifically mention employing a carbon steel acid gas purification apparatus. See the Brief, page 15. However, we find that Pearce clearly teaches that its corrosion inhibitors are useful for all conventional acid gas purification ***metal*** apparatuses, inclusive of a conventional carbon steel acid purification apparatus, as taught by Butwell, page 4, and Foroulis, page 23. Moreover, we find that Butwell teaches carbon steels are a good corrosion resistant material useful for forming an acid purification apparatus (column 4, lines 33-44) even though, according to Foroulis (page 23), they can still be corroded during the acid gas purification process. Thus, we concur with the examiner that it would have been *prima facie* obvious to employ conventional

acid gas purification apparatuses, such as a conventional carbon-steel acid gas purification apparatus, as the acid gas purification apparatus used in the gas purification process described in Pearce, especially since the conventional carbon-steel acid purification apparatus can further minimize the corrosion rate.

Thus, having carefully considered the applied prior art references of record, we conclude that the examiner has established a *prima facie* case of obviousness. In reaching this conclusion, we have also considered the appellants' arguments which are mainly directed to the difference between the claimed subject matter and the individual references. However, we determine them to be unconvincing because what the prior art references individually disclose or would have suggested is not the appropriate inquiry, when the rejections are based on a combination of the prior art references. The appropriate inquiry is what the combination of the disclosures taken as a whole would have suggested to one of ordinary skill in the art. *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981).

To rebut the *prima facie* case established by the examiner, the appellants argue (Reply Brief, page 2) that:

> The use of an aqueous hindered amine absorbent solution was found by the Appellants to unexpectedly substantially reduce the corrosion of carbon steel equipment, which is caused by the presence of oxygen in the combustion gas, during the CO_2 removal process. The addition of cupric carbonate to the hindered amine absorbent solution further decreased the corrosion of carbon steel in such a system. Evidence of such unexpected results are seen in Table 1 of the present invention.

It is incumbent upon the appellants to establish that the claimed subject matter imparts unexpected results. *See, e.g., In re Klosak*, 455 F.2d 1077, 1080, 173 USPQ 14, 16 (CCPA 1972) (the burden of showing unexpect results rests on the party who assert them). However, we hold that the showing in Table 1 referred to by the appellants is not persuasive of non-obviousness of the claimed invention for at least two reasons.

First, the showing is not directed to a comparison between the claimed subject matter and the closest prior art, Pearce and Sartori. *See In re Baxter Travenol Labs.*, 952 F.2d 388, 392, 21 USPQ2d 1281, 1285 (Fed. Cir. 1991); *In re De Blauwe*, 736 F.2d 699, 705, 222 USPQ 191, 196 (Fed. Cir. 1984). We find that Pearce is the closest prior art since it teaches using a combination of copper carbonate (corrosion inhibitor) and an absorbent solution as required by the claims on appeal. We find

that Sartori also is the closest prior art since it teaches using a combination of a corrosion inhibitor and the claimed specific sterically hindered amine absorbent.

Secondly, the showing is not reasonably commensurate in scope of the claimed subject matter. *See In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 778 (Fed. Cir. 1983); *In re Clemens*, 622 F.2d 1029, 1035, 206 USPQ 289, 296 (CCPA 1980). While the showing is drawn to using a few specific absorbents with or without a specific amount of cupric carbonate, the claims on appeal are not so limited. On this record, the appellants have not demonstrated that such showing is predictive of the entire scope of the claimed subject matter.

Under the circumstances recounted above, we determine that the evidence of obviousness, on balance, outweighs the evidence of nonobviousness. Hence, we conclude that the claimed subject matter as a whole would have been obvious to one of ordinary skill in the art in view of the applied prior art references. Accordingly, we affirm the examiner's decision rejecting claims 1, 4 through 10 and 12 through 19 under 35 U.S.C. § 103.

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

AFFIRMED

BRADLEY R. GARRIS Administrative Patent Judge	)	
CHUNG K. PAK Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
BEVERLY A. PAWLIKOWSKI Administrative Patent Judge	)	

CKP:hh

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