THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 10

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DENNIS W. JOHNSON, PERVAJE A. BHAT and THOMAS R. GOOTS

Appeal No. 97-2914
Application no. 08/448,060[1]

ON BRIEF

Before DOWNEY, WILLIAM F. SMITH and LORIN, Administrative Patent Judges,

DOWNEY, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. ' 134 from the final rejection of claims 9-14.

Claim 9, the only independent claim, is illustrative of the subject matter on appeal and reads as follows:

> A system for removing SO_3 and SO_2 from a flue gas produced by the burning of a fossil fuel, comprising:

[1] This application is a divisional continuation of US appl. no. 08/235,597, filed April 29, 1994. The claims of 08/235,597 also are the subject of appeal no. 97-1551, which is being decided concurrently with the instant appeal.

a duct supplying a flue gas containing SO_3 and SO_2;

particulate collection means for removing particulates from the flue gas to produce partially cleaned flue gas;

flue means for conveying the partially cleaned flue gas from the particulate collection means;

means for injecting an amount of dry sorbent having a particle size range larger than approximately 1.0 B 2.0 microns into the flue gas conveyed within the flue means that is sufficient to react with and remove substantially all of the SO_3 from the partially cleaned flue gas to produce a substantially SO_3-free flue gas containing reacted dry sorbent and unreacted dry sorbent; and

wet scrubber means for removing SO_2 from the substantially SO_3-free flue gas, the wet scrubber means wetting both the reacted and unreacted dry sorbent in the substantially SO_3-free flue gas, thereby making the unreacted dry sorbent available as a wet reagent for SO_2 removal, the wet reagent reacting with the SO_2 in the wet scrubber means to remove SO_2 from the substantially SO_3-free flue gas.

The references relied upon the examiner are:

Cyran et al. (Cyran) 4,555,391 November 26, 1985

British Patent (Steag) 1,589,999 May 28, 1981

Kohl et al. (Kohl), Gas Purification, 4th ed., Gulf Publishing Company (1985), pp. 302, 303, and 306-320.

Rejections

Claims 9-14 stand rejected under 35 U.S.C. ' 103. The examiner relies upon Kohl, Cyran, Steag, and appellants: admission as evidence of obviousness. We reverse the rejection and institute new grounds of rejection under 37 C.F.R. ' 1.196(b).

The claims at issue

Claim 9, representative of the claims on appeal, is directed to a system for removing SO_3 and SO_2 from a flue gas produced by burning fossil fuel comprising, as summarized below:

a duct supplying a flue gas containing SO_3 and SO_2;

a particulate collection means for removing particulates from the flue gas to produce a partially cleaned flue gas;

flue means for conveying the partially clean flue gas from the particulate means (Fig. 7-2);

means for injecting dry sorbent into the partially cleaned flue gas within the flue means, wherein

the dry sorbent has a particle size range larger than approximately 1.0 microns[2],

the amount of dry sorbent is sufficient to react with and remove substantially all of the SO_3 in the flue gas, and

the substantially SO_3-free flue gas contains both reacted and unreacted sorbent;

wet scrubber means for removing SO_2 from the substantially SO_3-free flue gas, which **B**

wets and removes the reacted sorbent and unreacted sorbent from the substantially SO_3-free flue gas,

makes a wet reagent with the unreacted dry sorbent,

the wet reagent reacting with the SO_2 in the wet scrubber means to remove SO_2 from the substantially SO_3-free flue gas.

Prior art cited by the examiner as evidence of obviousness

The examiner relies upon Kohl as the primary reference. Kuhl teaches:

[2] Claim 9 provides for a particle range larger than approximately 1.0-2.0 microns, but as noted below, that limitation is indefinite. For the purpose of considering the rejections under 35 U.S.C. ' 103, claim 9 is interpreted in a manner that renders it definite. See Ex parte Ionescu, 222 USPQ 537, 540 (BPAI 1984).

A duct for providing flue gas containing SO_3 and SO_2 produced by burning fossil fuel (pp. 302 and 303).[3] The SO_3 can be highly corrosive, especially when the SO_3 reacts with water to form sulfuric acid (para. bridging pp. 302 and 303).

A particulate collection means for removing particles from the flue gas to produce a partially cleaned flue gas (p. 309, Fig. 7-2, Ash Collector).

A flue means for conveying the partially cleaned flue gas from the particulate collection means (Fig. 7-2).

Means for injecting an aqueous solution of Ca, Mg, or Na based reagents (p. 308, Table 7-7) wherein make-up limestone is fed to the wet scrubber means through the limestone slurry tank (p. 309, Fig. 7-2).

5. A wet scrubber means for removing SO_2 from the substantially SO_3-free flue gas, which

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makes a wet reagent with materials such as lime (CaO), limestone ($CaCO_3$), and magnesium oxide (MgO) (p. 308, Table 7-7; compare, present claim 11, and p. 7, lines 20-24, of the present specification),

reacting the wet reagent with the SO_2 in the wet scrubber means to remove SO_2 from the flue gas (p. 306, Figure 7-1; and pp. 307-320).

There are differences between the teachings of Kohl and the claimed invention.

[3] The Aflue@ in flue gas is a duct.

Kohl does not disclose means specifically for removing substantially all the SO_3 from the flue gas.

Kohl discusses SO_3 formation at pp. 302 and 303, but its formation is attributed to process condition variables such as air/fuel ratios, fuel composition, temperature, etc.

Kohl addresses means for removing SO_2 elsewhere and the examiner points to no teaching in Kohl on means for the actual removal of SO_3 in particular from a flue gas.

Kohl does not describe means for injecting dry sorbent particles into the flue gas after particulate collection and before wet scrubbing, so that some of the dry sorbent particles react with and remove substantially all the SO_3 in the flue gas, and so that the unreacted dry sorbent particles

form a wet reagent to remove SO_2 from the substantially SO_3-free flue gas during wet scrubbing.

Kohl describes a Adry plus wet@ means at p. 307, para. 4, but that means involves the in-situ injection of limestone ($CaCO_3$) directly into the furnace. Contrary to that description, the presently claimed invention includes a particulate collection means which would work against the process described in Kohl by intercepting the lime particles after they leave the furnace and before they enter the wet scrubber. Kohl also discounts the in-situ means because of Anumerous operational problems@ in the same paragraph.

Kohl discloses the Aconcept of combining fly ash particulate removal with the SO_2

removal scrubber@ as offering Aa very large potential for cost savings by eliminating the need for an electrostatic precipitator or baghouse@, but Kohl also lists several drawbacks to that concept (para. bridging pp. 307 and 309). In any case, the presently claimed invention captures the fly ash in the particulate collection means before it reaches the dry sorbent and wet scrubber stages.

Kohl does not teach that the dry sorbent particles are larger than 1.0 micron.

The Examiner cites Cyran, Steag, and appellants= Aadmission@ as secondary references to account for the differences between Kohl and the claimed invention.

The examiner addresses the claimed removal of substantially all the SO_3 from the flue gas with the teachings of Steag and the Aadmission@ of appellants.

The examiner relies upon Steag to show means for removal of SO_3 from flue gas by dry gas cleansing (p. 2, lines 4-13).

b. The examiner further relies upon appellants= Aadmission@ as suggesting the desirability of removing substantially all the SO_3 from the flue gas.

The examiner points to appellants= Aadmission@ at p. 5, lines 3 and 4, of the specification that A(i)t is well-known in the pollution control field that a wet scrubber does not effectively remove SO_3 from flue gas.@

ii. The examiner further notes that SO_3 is corrosive.

In light of the Aadmission@ and the corrosiveness of SO_3, the examiner concludes that it would have been obvious Ato remove the corrosive

SO_3 before it reaches the wet scrubber, which was known to be not effective in removing SO_3 .@

The examiner cites Cyran and Steag as suggesting the dry cleaning of flue gas after the particulate collection step.

The examiner relies on Cyran as teaching a means for injecting dry sorbent into a flue gas for removing sulfur oxides (Figure; col. 2, line 55, through col. 3, line 21). However, the reference also discloses a baghouse filter downstream from the dry sorbent injection (col. 3, lines 46-56).

The reference does not describe a particulate collection means upstream from the dry sorbent injection means. Instead, the particulates are captured in the baghouse filter, along with the spent dry sorbent (col. 3, lines 39-45).

The reference does not teach the removal of SO_3 in particular from the flue gas. Rather, it specifically refers to SO_2 removal throughout, with only the mention of Asulfur oxides@ at col. 6, lines 26 and 27.

The examiner further relies upon Steag as setting forth a means for removing SO_2/SO_3 out of a flue gas by initially passing the contaminated gas through a dust collector followed by a dry cleaning of the gas to remove SO_2/SO_3 (p. 2, lines 4-13).

After the dry cleaning, however, Steag captures the particles in a cloth filter (p. 2, lines 75-83).

Steag does not teach the actual injection of dry sorbent particles into the flue gas stream after the particulate collection step.

Instead, the reference teaches a multiple stage filtration in which the dust content is reduced from 10-15 g/m^3 to 600 mg/ m^3 in the first filtration, to 100-200 mg/ m^3 after the dry gas cleaning stage, and to 10 mg/ m^3 in the final filtration (p. 2, lines 55-83 and 105-115).[4]

The reference does not explicitly discuss the dry gas cleaning process itself but only indicates that such processes are "known per se" at p. 2, line 15.

Steag does not teach wet scrubbing in particular but only acknowledges the existence of such processes in the prior art at p. 1, lines 60-65.

[4] The "10 to 15 mg/ m^3" reported at p. 2, line 57, of Steag is an obvious typographical error.

The examiner relies upon Cyran to show dry sorbent particles of 140-325 mesh (col. 6, lines 38-46), i.e., 106-45 microns in size, which meets the greater than 1.0 micron limitation presently claimed.[5]

Opinion

We reverse the rejection of claims 9-14 under 35 U.S.C. ' 103 as being unpatentable over Kohl in view of Cyran, Steag, and appellants= admission, as set forth at pp. 4 and 5 of the March 13, 1997 Examiner=s Answer.

The examiner essentially argues it would have been obvious to one of ordinary skill in the art at the time the invention was made to remove SO_3 from a flue gas with a dry sorbent step and then remove SO_2 in a wet scrubber step because:

Flue gas is known to have SO_3 and SO_2, both of which are pollutants to be removed from flue gas.

The dry sorbent means is known for removing SO_3 and the wet scrubber means is known for removing SO_2.

The use of both the dry sorbent means and the wet scrubber means on the same flue gas would have been expected to remove both SO_3 and SO_2.

The SO_3 removal step would have to proceed first because B

the wet scrubbing means is not efficient at removing SO_3; and

the same gas would have damaged other equipment downstream.

[5] The examiner refers to 140 mesh as 1/140 inch (18 microns), but the correct conversion for 140 mesh is 106 microns. The conversion for 325 mesh is 45 microns. See ÁStandard Test Sieves@, CRC Handbook of Chemistry and Physics, 63rd ed., 1982, p. F-122.

The fact remains, however, that none of the prior art references or Aadmission@ cited by the examiner, individually or in combination, teach or suggest the means for injecting dry sorbent particles into the flue gas after particulate collection and before wet scrubbing, so that some of the dry sorbent particles react with and remove substantially all the SO_3 in the flue gas, followed downstream by the means for conveying the

substantially SO_3-free gas, reacted dry sorbent, and unreacted dry sorbent particles to a wet scrubber means in which the unreacted dry sorbent is available as a wet reagent to remove SO_2 from the substantially SO_3-free flue gas during wet scrubbing.

Both Cyran and Steag teach dry cleaning or sorbent means, but both also teach removal of the particles downstream with filters. The examiner argues that the present claims have the term Acomprising@ which does not exclude the filter of Cyran or Steag. Nevertheless, the presence of a filter would undermine the requirement in the claimed invention that the unreacted dry sorbent particles are conveyed into the wet scrubber means to produce a wet reagent for removing SO_2. The examiner has provided no other evidence suggesting to one of ordinary skill in the art a modification of the prior art so that the dry sorbent passes into the wet scrubber means as required in the presently claimed process. Without such evidence, the prima facie determination of obviousness for the claimed invention as a whole cannot stand. See In re Dembiczak, 175 F.3d 994, 1000, 50 USPQ 2d 1614, 1618 (Fed. Cir. 1999).

The prior art cited by the examiner can be seen as Ateaching away@ from the presently claimed invention on this point. As discussed above, both Cyran and Steag teach the interception of particles downstream from the dry cleaning or sorbent step with a filter. Interception suggests that the sorbent particles have no other use, which Ateaches away@ from the downstream use of those particles. As

discussed above, Kohl lists several drawbacks to the Ain situ calcination of limestone@ and the Aconcept of combining fly ash particulate removal with the SO_2 removal scrubber@ (p. 307, para. 4, through p. 309). Those drawbacks would further Ateach away@ from the

downstream use of particles. Prior art references must be considered in their entireties, i.e., as a whole, including portions that would lead away from the claimed invention. See W.L. Gore & Associates, Inc. v. Garlock, 721 F. 2d 1540, 1550, 220 USPQ 303, 311 (Fed. Cir. 1983), cert. den., 469 U.S. 851 (1984).

NEW GROUND OF REJECTION UNDER 37 CFR 1.196(b)

Pursuant to the provisions of 37 C.F.R. ' 1.196(b), we make the following new grounds of rejection.

Claims 9-14 are rejected under 35 U.S.C. ' 112, second paragraph, as being indefinite.

Claim 1, lines 7 and 8, recites Aa particle size range larger than approximately 1.0-2.0 microns@, but it is unclear whether the particles are larger than 1.0 micron or 2.0 micron.[6] Clarification is needed. For example, are particles having a size of 1.5 micron within or without the claims.

CONCLUSION

We reverse the rejection of claims 9-14.

This decision contains a new ground of rejection pursuant to 37 C.F.R. ' 1.169(b)(amended effective Dec. 1, 1997, by final rule notice, 62 Fed. Reg. 53, 131, 53, 197 (Oct. 10, 1997), 1203 Off. Gaz. Pat. & Trademark Office 63, 122 (Oct. 21, 1997)). 37 C.F.R. ' 1.169(b) provides that, AA new ground of rejection shall not be considered final for

[6] Reference is made to lines 7 and 8 of claim 9 in the June 10, 1996 Amendment.

purposes of judicial review.@

37 C.F.R. ' 1.196(b) also provides that the appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect tot he new ground of rejection to avoid termination of proceedings (' 1.197(c)) as to the rejected claims:

> Submit an appropriate amendment of the claims so rejected or a showing of facts relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the application will be remanded to the examiner. . . .
>
> Request that the application be reheard under ' 1.197(b) by the Board of Patent Appeals and Interferences upon the same record. . . .

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

Reversed B 37 C.F.R. ' 1.196(b)

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