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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MARK T. ANDERSON,
RACHAEL A.T. GOULD, and JEFFRY L. JACOBS[1]

Appeal 2014-001961
Application 11/375,644
Technology Center 1600

Before FRANCISCO C. PRATS, JACQUELINE T. HARLOW, and TAWEN CHANG, *Administrative Patent Judges*.

PRATS, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal under 35 U.S.C. § 134(a) involves claims to articles, useful as construction materials, that have biocidal ingredients incorporated into them. The Examiner rejected the claims for obviousness.

We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

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[1] Appellants state that the "real party in interest is 3M Company (formerly known as Minnesota Mining and Manufacturing Company) of St. Paul, Minnesota and its affiliate 3M Innovative Properties Company of St. Paul, Minnesota." Br. 2.

STATEMENT OF THE CASE

The Specification discloses "biocidal construction substrates that include a biocidal material within the construction substrate and a biocidal polymeric layer disposed on the construction substrate surface." Spec. 2.

The Specification discloses that the "combination of biocidal material within the structural layer and the biocidal coating on the structural layer unexpectedly provides long-term resistance to staining from bio-organisms or from airborne contaminants." *Id.* at 3.

In particular, the Specification explains, when exposed to ultraviolet (UV) light from sunlight, "the photocatalytic titania in the structural layer and coatings[] photo-oxidizes organic materials. For example, it oxidizes materials such as volatile organic compounds, soot, grease, and micro-organisms; all of which can cause unsightly discoloration." *Id.*

Claim 1, the only independent claim on appeal, and claims 5 and 7 illustrate the appealed subject matter, and read as follows (Br. 8):

1. A structure comprising:
   a structural layer comprising a biocidal material further comprising photocatalytic particles selected from the group consisting of ZnO, WO_3, SnO_2, $CaTiO_3$, Fe_2O_3, MoO_3, Nb_2O_5, $Ti_xZr_{(1-x)}O_2$, SiC, $SrTiO_3$, CdS, GaP, InP, GaAs, $BaTiO_3$, $KNbO_3$, Ta_2O_5, Bi_2O_3, NiO, Cu_2O, SiO_2, MoS_2, InPb, RuO_2, CeO_2, $Ti(OH)_4$, or combinations thereof, the structural layer having an external surface; and
   a biocidal polymeric coating layer on the external surface, wherein the biocidal polymeric coating layer comprised photocatalytic particles and polyacrylate.

> 5. The structure according to claim 1 wherein the biocidal polymeric coating layer comprises a quaternary ammonium compound and a polymeric material
>
> 7. The structure according to claim 1 wherein the structural layer is formed from concrete.

The following rejections are before us for review:

(1) Claims 1, 3, 4, 6–8, 11, 13, and 14, under 35 U.S.C. § 103(a), for obviousness Freed,[2] Beverly,[3] Bygott,[4] and Haneda[5] (Final Action 2–6); and

(2) Claims 5 and 9, under 35 U.S.C. § 103(a), for obviousness over Freed, Beverly, Bygott, and Sengupta[6] (Final Action 7–8).

OBVIOUSNESS—
FREED, BEVERLY, BYGOTT, AND HANEDA

The Examiner's Position

Appellants do not present separate arguments as to any of the claims subject to this ground of rejection. Accordingly, we limit our analysis to claim 1. *See* 37 C.F.R § 41.37(c)(1)(iv).

The Examiner cited Freed as describing reinforced concrete having antimicrobial fibers dispersed throughout the concrete to reduce the growth of mold and mildew on the concrete. Final Action 3–4. The Examiner found that Freed differs from claim 1 in that Freed does not teach "a biocidal polymeric coating layer in addition to the antimicrobial agent incorporated

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[2] U.S. Patent No. 6,162,845 (issued Dec. 19, 2000).
[3] EP 1 550 691 A1 (published July 6, 2005).
[4] U.S. Patent No. 7,521,039 B2 (issued Apr. 21, 2009).
[5] Di Li and Hajime Haneda, *Morphologies of zinc oxide particles and their effects on photocatalysis*, 51 Chemosphere 129–137 (2003) ("Haneda").
[6] WO 02/10244 A2 (published Feb. 7, 2002).

into the concrete. Freed also does not explicitly teach a photocatalytic particle incorporated into the concrete." *Id.* at 4.

To address those differences, the Examiner cited Beverly as evidence that it was known in the art to apply a polymeric coating, composed of polyacrylate and photocatalytic particles as required by claim 1, to building materials. *Id.* at 4–5. The Examiner cited Bygott as evidence that it was known in the art to include titanium dioxide as an antimicrobial photocatalytic material in building materials, both in coatings, and in the materials themselves. Final Action 5. The Examiner cited Haneda as evidence that the zinc oxide recited in Appellants' claim 1 was known in the art to be an equivalent photocatalytic material to Bygott's titanium dioxide. *Id.*

Based on the references' teachings, the Examiner concluded that an ordinary artisan would have considered it obvious to combine Beverly's polymeric coating layer "with the antimicrobial reinforced concrete material as taught by Freed." *Id.* The Examiner reasoned that an ordinary artisan "would have been motivated to do so in order to reinforce the antimicrobial activity in the substrate by combining it with an antimicrobial coating. This combination utilizes two individually known antimicrobial active agents which reasonably would have been expected to maintain their efficacy upon combination." *Id.* at 5–6.

The Examiner reasoned that an ordinary artisan also would have been motivated to combine the teachings of Freed and Beverly in the posited manner, "based on the explicit suggestion of Bygott et al. which teaches the preferable inclusion of titanium dioxide (a photocatalyst and biocide) in both the substrate and its coating." *Id.* at 6. The Examiner reasoned that a skilled

artisan "further would have been motivated to include zinc oxide in place of or in addition to titanium dioxide as taught by Haneda, since Haneda teaches these materials as equivalent photocatalysts having a characteristic similar band gap." *Id.*

Lastly, the Examiner concluded that an ordinary artisan would have considered it obvious to include zinc oxide and, optionally, titanium dioxide photocatalytic particles into Freed's antimicrobial concrete, "since Freed teaches that an antimicrobial active is any substance which effectively protects the fibers and concrete from biological attack from organisms, and since Beverly teaches zinc oxide and titanium dioxide and additional antimicrobial actives such as triclosan to be useful in building materials." Final Action 6 (citing MPEP § 2144.06; *In re Kerkhoven*, 626 F.2d 846, 850 (CCPA 1980) ("It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition which is to be used for the very same purpose. . . . [T]he idea of combining them flows logically from their having been individually taught in the prior art.").

Analysis

As stated in *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992):

> [T]he examiner bears the initial burden . . . of presenting a *prima facie* case of unpatentability. . . .
>
> After evidence or argument is submitted by the applicant in response, patentability is determined on the totality of the record, by a preponderance of evidence with due consideration to persuasiveness of argument.

We adopt the Examiner's findings of fact and reasoning regarding the scope and content of the prior art as set out in the Final Action, discussed

above, and in the Examiner's Answer. Appellants' arguments do not persuade us that a preponderance of the evidence fails to support the Examiner's prima facie case of obviousness as to representative claim 1.

Appellants contend initially that the cited references do not suggest the structure of claim 1, which requires both a structural layer that includes photocatalytic particles, as well as a polymeric coating on the surface of the structural layer. Br. 4–5. In particular, Appellants contend, Bygott "appears to describe only using photocatalytic particles in a structural layer *or* a coating layer, but does not appear to describe a photocatalyst in a structural layer that is *covered* by a coating layer." Br. 4. Accordingly, Appellants contend, "the cited references do not appear to describe or suggest each element of independent claim 1, and claim 1 is not unpatentable under 35 U.S.C. § 103(a) in view of the proposed combination." *Id.* at 5.

We are not persuaded. As the Supreme Court explained in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), "when a patent 'simply arranges old elements with each performing the same function it had been known to perform' and yields no more than one would expect from such an arrangement, the combination is obvious." *Id.* at 417 (quoting *Sakraida v. Ag Pro, Inc.*, 425 U.S. 273, 282 (1976)).

In the instant case, Appellants' claim 1 recites a structure composed of two layers: (1) a structural layer that includes a biocidal material composed of photocatalytic particles, and (2) a coating layer composed of photocatalytic particles and polyacrylate. Br. 8. Claim 1 limits the photocatalytic particles in the structural layer to a number of materials, including zinc oxide. *Id.*

Bygott is directed to preparation of a specific crystalline form of titanium dioxide photocatalytic particle. Bygott, abstract. Like Appellants' Specification, Bygott explains that photocatalysts "typically comprise one or more metal oxides, such as titanium dioxide, zinc oxide, tungsten oxide and/or zirconium oxide. Titanium dioxide, which is a particularly common photocatalyst, has for example, been used in applications, such as air-conditioning to remove toxic or malodorous substances, water purification and destruction of harmful bacteria." *Id.* at 1:21–27.

The following passage from Bygott, upon which Appellants focus their contentions (*see* Br. 4–5), explains that photocatalytic particles can be included in a number of different building materials:

> The photocatalyst of the present invention may, for example, be incorporated into a photocatalytic article. The phrase "photocatalytic article" refers to a substrate that has been combined with a photocatalyst. According to the present invention, preferably the substrate is selected from the group consisting of ceramic tile, glass, concrete, metals and polymeric substances and is coated with the above-described photocatalytic particles. Methods for incorporating photocatalysts into photocatalytic articles are well known to persons skilled in the art.
>
> *The photocatalyst may also be incorporated directly* or as part of a photocatalytic article into a "photocatalytic composition." Examples of photocatalytic compositions include but are not limited to photocatalytic paints, photocatalytic coatings, photocatalytic cement and photocatalytic mortar. Methods for incorporating photocatalysts and/or photocatalytic articles into photocatalytic compositions are also well known to persons skilled in the art.
>
> The photocatalysts of the present invention may be used directly or as part of photocatalytic articles or photocatalytic compositions in applications, including but not limited to, environmental abatement and defogging of mirrors and glass by

> exposing the photocatalyst, the photocatalytic article or photocatalytic composition to ultraviolet and/or visible light.

Bygott, 4:14–37 (emphasis added).

Given this disclosure, it is evident that Bygott contemplates including photocatalytic particles in building materials, both in the form of a "photocatalytic article" such as coated concrete (*id.* at 4:16–20), and also "*directly or as part of a photocatalytic article* into a 'photocatalytic composition,"' examples of which include "photocatalytic cement and photocatalytic mortar." *Id.* at 4:24–28 (emphasis added). We are not persuaded, therefore, that the coating embodiment and direct incorporation embodiment described by Bygott are mutually exclusive, as Appellants aver. *See* Br. 4–5.

Given Bygott's disclosure of the desirability of including photocatalytic particles in both coatings as well as directly in substrates used in building materials, Appellants also do not persuade us that a preponderance of the evidence fails to support the Examiner's finding that an ordinary artisan would have been motivated to combine a photocatalytic particle-containing coating with a photocatalytic particle-containing substrate "in order to reinforce the antimicrobial activity in the substrate by combining it with an antimicrobial coating." Final Action 5–6.

To that end, we note that Freed teaches the desirability of including essentially any type of antimicrobial agent (Freed 5:31–36) in fibers dispersed in a variety of building material substrates similar to those described in Bygott, including concrete, as well as "mortar, grout, shotcrete, cast in place concrete, stucco, cementitious aggregate, asphalt concrete and

the like, and mixtures thereof, all of which generally comprise hardenable concrete-like materials." *Id.* at 3:42–45.

Beverly, like Bygott, teaches the desirability of including a biocidal compound in an acrylate-based coating for building materials (Beverly, abstract), the biocidal compound including, among others, the zinc oxide recited in Appellants' claim 1. *Id.* at ¶ 15.

Haneda, also like Bygott, teaches that claim 1's zinc oxide was an art-recognized photocatalytic compound similar in properties to titanium dioxide. Haneda 129 ("Since ZnO has almost the same band gap energy (3.2 eV) as TiO_2, its photocatalytic capacity is anticipated to be similar to that of TiO_2."); *see also* Bygott 1:21–23 (zinc oxide among compounds typically included in photocatalysts).

Thus, in addition to Bygott's express teaching that antimicrobial photocatalytic agents are desirably included in building material coatings, as well as being dispersed into the building materials themselves, Freed teaches that antimicrobial compounds are desirably incorporated into building materials, and Beverly teaches that antimicrobial photocatalytic materials may be incorporated into building material coatings. Further, Haneda, like Bygott, teaches that zinc oxide was known in the art to be a photocatalytic compound. Appellants do not, therefore, persuade us that the cited references fail to provide reason for preparing a structure having all of the features required by claim 1. Moreover, because the suggestion for preparing a composition having the claimed features comes from the prior art, we do not find Appellants' arguments regarding improper hindsight convincing. *See* Br. 6.

We are also unpersuaded by Appellants' contention that the cited references fail to support "the suggestion that incorporation of photocatalytic particles would maintain efficacy when covered by a polymer coating. That is, none of the cited references describe that a light activated photocatalytic material would function as described when covered by a polymeric coating." Br. 5.

Contrary to Appellants' contention, rather than suggesting that its coating would block light penetration, and thereby prevent activation of the photocatalytic particles, Beverly discloses that its coatings are preferably transparent. Beverly ¶ 22. Freed, moreover, discloses incorporating biocidal particles into the actual building material to ensure the absence of microbial growth in the event the material cracks, thus suggesting that it would be desirable to disperse biocidal particles within a building material even if it were coated. Freed 6:47–50 ("[I]n view of the zones of inhibition achieved, protection against bacteria, mold, fungi and the like is available even should the concrete crack, unless, of course, there is gross contamination.").

As to Appellants' assertions regarding unexpected results (Br. 6 (citing Spec. 3)), Appellants do not direct us to any specific comparison between a claim-encompassed embodiment and the closest prior art. We, therefore, find these assertions insufficient to demonstrate nonobviousness. *See In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991) ("[W]hen unexpected results are used as evidence of nonobviousness, the results must be shown to be unexpected compared with the closest prior art.").

Lastly, Appellants do not persuade us that an ordinary artisan would have considered it illogical to combine Freed and Beverly in the manner posited by the Examiner. *See* Br. 6–7. It might be true, as Appellants contend, that neither Freed nor Beverly expressly describes any shortcoming in the techniques they respectively use to protect building materials from microbial contamination.

As the Supreme Court has explained, however, in determining whether the prior art supplies a reason for practicing the claimed subject matter, the 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*, 550 U.S. at 418; *see also id.* at 421 ("A person of ordinary skill is . . . a person of ordinary creativity, not an automaton.").

In the instant case, we agree with the Examiner that an ordinary artisan would have reasonably inferred that, by both coating a building material substrate, such as concrete, with antibacterial photocatalytic particles as taught by Bygott and Beverly, and also dispersing antibacterial photocatalytic particles within the building material substrate, as taught by Bygott and Freed, one would "reinforce the antimicrobial activity in the substrate" (Final Action 5–6), thus providing a building material maximally protected against microbial contamination.

In sum, for the reasons discussed, Appellants' arguments do not persuade us that the evidence of record fails to support the Examiner's prima facie case of obviousness as to claim 1. As also discussed above, Appellants have not advanced secondary evidence of nonobviousness sufficient to outweigh the Examiner's evidence of prima facie obviousness. Accordingly,

we affirm the Examiner's rejection of claim 1 over the cited references. Because they were not argued separately, claims 3, 4, 6–8, 11, 13, and 14 fall with claim 1. *See* 37 C.F.R § 41.37(c)(1)(iv).

OBVIOUSNESS—
FREED, BEVERLY, BYGOTT, AND SENGUPTA

In rejecting claims 5 and 9, both of which depend from claim 1, the Examiner relied on the teachings of Freed, Beverly, and Bygott discussed above, and cited Sengupta as evidence that an ordinary artisan would have considered it obvious to include, in a biocidal coating, a quaternary ammonium compound, as recited in claims 5 and 9. Final Action 7–8.

Appellants contend only that Sengupta fails to remedy the previously argued deficiencies, addressed above, of the combination of Freed, Beverly, and Bygott as to claim 1. Br. 7. As seen above, however, Appellants do not persuade us that the combination of Freed, Beverly, and Bygott is deficient in demonstrating the obviousness of the structure recited in claim 1. Accordingly, because Appellants do not identify, nor do we discern, any deficiency in the Examiner's conclusion of obviousness as to claims 5 and 9, we affirm the Examiner's rejection of those claims as well.

SUMMARY

For the reasons discussed, we affirm the Examiner's rejection of claims 1, 3, 4, 6–8, 11, 13, and 14, under 35 U.S.C. § 103(a), for obviousness Freed, Beverly, Bygott, and Haneda.

For the reasons discussed, we also affirm the Examiner's rejection of claims 5 and 9, under 35 U.S.C. § 103(a), for obviousness over Freed, Beverly, Bygott, and Sengupta.

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

AFFIRMED