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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* RICHARD B. STEVENS and CHARLES J. MILLER

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Appeal 2017-002755  
Application 12/621,835  
Technology Center 1700

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Before ROMULO H. DELMENDO, LINDA M. GAUDETTE, and  
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL<sup>1</sup>

Appellants<sup>2</sup> appeal under 35 U.S.C. § 134(a) from the Examiner’s decision finally rejecting claims 1–17 and 21–23. An oral hearing was conducted on January 17, 2019, before this Board panel. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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<sup>1</sup> This Decision includes citations to the following documents: Specification filed Nov. 19, 2009 (“Spec.”); Final Office Action dated Jan. 14, 2016 (“Final”); Appeal Brief filed June 10, 2016 (“Appeal Br.”); Examiner’s Answer dated Nov. 4, 2016 (“Ans.”); and Reply Brief filed Dec. 23, 2016 (“Reply Br.”).

<sup>2</sup> Appellants identify the real party in interest as United States Gypsum Company. Appeal Br. 2.

The invention relates to a ready-mix joint compound that chemically hardens quickly and reliably within a stated time. Spec. 1:7–9. In forming a wall, gypsum wallboard panels are attached to studs and joint compound is used to fill and coat the joints between the wallboard panels. *Id.* at 1:11–14. In general, joint compounds contain a filler, a binder, and a thickener. *Id.* at 2:10–11.

“[C]onventional fillers are calcium carbonate, calcium sulfate dihydrate (gypsum), and calcium sulfate hemihydrate (plaster of Paris).” *Id.* at 2:12–14. In addition to being added as a filler, calcium carbonate may be present as a naturally occurring contaminant of other raw materials. *Id.* at 3:28–4:1.

According to the Specification, calcium sulfate hemihydrate is used only in setting-type joint compounds. *Id.* at 2:14–15. Setting-type joint compounds containing calcium sulfate hemihydrate may be prepared as ready-mixed, pre-wetted product instead of a powder, provided that a set preventer is included in the product to interrupt the chemical conversion of calcium sulfate hemihydrate to calcium sulfate dihydrate. *Id.* at 3:6–9. The chemical conversion/setting reaction, is resumed by addition of a set initiator/accelerator. *Id.* at 3:18–19.

At the time of the invention, a known chemical set accelerator for calcium sulfate hemihydrate systems was alum.<sup>3</sup> *Id.* at 3:25–26. Alum, however, rarely was used because of excessive foam generation in the presence of calcium carbonate, resulting in loss of strength and surface cratering. *Id.* at 3:27–28, 4:1–2. The inventors are said to have discovered a ready-mixed, setting-type joint compound base to which a set preventer has been added that enables the use of alum as a set initiator without producing excessive foaming. *Id.* at 4:24–26. “The [inventive]

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<sup>3</sup> The Specification defines “alum” as “any aluminum sulfate, including aluminum disulfate, a double sulfate of potassium and aluminum and a double sulfate of aluminum and ammonia.” *Id.* at 11:8–10.

joint compound system utilizes a combination of a calcium-free phosphate set preventer, alum as a set initiator and a limited amount of calcium carbonate in the joint compound base.” *Id.* at 4:26–5:2.

Claim 1, reproduced below, is representative of the claims on appeal.

1. A joint compound system comprising:

alum;

a calcium-free phosphate set-preventing agent;

water; and

a setting type joint compound base comprising calcium sulfate hemihydrate, wherein said joint compound base has no added calcium carbonate, said calcium sulfate hemihydrate having less than about 2% by weight contaminant calcium carbonate;

wherein said alum is in the amount from 0.5% to 2% by weight of the joint compound base; and wherein said alum is mixed with the joint compound base; and

wherein the joint compound system has a viscosity in the range from 200 to 400 Brabender units.

Appeal Br. A-1. Claim 21, the only other independent claim on appeal, differs from claim 1 in that it specifies that the alum is “a double sulfate selected from the group consisting of a double sulfate of potassium and aluminum, a double sulfate of aluminum and ammonia, and a combination thereof.” *Id.* at A-4.

The claims stand rejected under 35 U.S.C. § 103(a) as follows:

1. claims 1–14, 17, 21, and 22 over Halm (US 6,740,395 B2, issued May 25, 2004) in view of Miller (WO 2005/072948 A1, published Aug. 11, 2005) and Patel (US 5,653,797, issued Aug. 5, 1997);

2. claims 16 and 23 over Halm in view of Miller, Patel, and Williams (US 4,454,267, issued June 12, 1984);

3. claims 14, 15, and 22 over Halm in view of Miller, Patel, and Espinoza (US 5,746,822, issued May 5, 1998); and

4. claims 1–17, 21, and 23 over Patel in view of Miller and Halm.

*The Applied Prior Art*

Halm discloses a process for preparing a smooth-surfaced, gypsum (i.e., calcium sulfate dihydrate)-coated substrate from a rough-surfaced substrate, such as fiberboard. Halm 2:38–40, 67. Halm’s process involves applying a calcium sulfate hemihydrate-containing coating composition to a fiberboard surface where the calcium sulfate hemihydrate hydrates to form gypsum. *Id.* at 2:47–49, 64–67. The coating composition contains a set preventer, e.g., a non-calcium bearing phosphate compound, to inhibit setting until after deposition on the surface of the fiberboard. *Id.* at 2:51–53, 4:2–4. A set initiator must be present, either in or on the surface of the fiberboard, or introduced into the coating as it is applied. *Id.* at 3:1–3. Halm discloses that aluminum sulfate is a preferred set initiator because it has the advantage of rapidly hydrating the calcium sulfate hemihydrate. *Id.* at 3:7–8, 13–14; *see also id.* at 4:61–62. According to Halm, “[w]hen set initiators are used with ready-mixed setting-type joint compounds, it is typical that they are mixed thoroughly with the ready-mixed joint setting-type compound just prior to use.” *Id.* at 5:12–15. Halm teaches that in the disclosed invention, “the ready-mixed coating composition could be mixed with a set initiator as it is applied, but preferably, the set initiator is included in the gypsum formulation used in making the fiberboard or is applied to the top of the fiberboard as it is curing.” *Id.* at 5:17–21. Halm explains that “aluminum sulfate is sufficiently active so that its presence on the surface of the fiberboard is sufficient to begin the setting process, which then proceeds throughout the coating layer.” *Id.* at 5:21–25. According to Halm, “[t]he amount of the set initiator will depend on the amount required to overcome the set preventing effect of the non-calcium bearing phosphates[,] . . . [g]enerally,

about 0.01 to 0.03 wt. % of the set initiator, based on the weight of the premixed first part of the coating compound, will be used.” *Id.* at 4:61–66.

Patel discloses “[a] process for the production of a ready-mixed setting-type joint compound [that] includes the use of calcium sulfate hemihydrate, water, and a set-retarding agent.” Patel, [57]. Patel discloses that a promoter or accelerator is added to the ready-mix compound just prior to use. *Id.* at 7:18–19. “The amount of accelerator is based generally upon the amount of calcium sulfate hemihydrate and retarder in the formulation.” *Id.* at 7:19–21. “[A]ccelerators are preferably added in an amount in the range of about 0.1 to about 5.0 weight percent, and more preferably about 0.1 to about 2.0 weight percent, based on the weight of the calcium sulfate hemihydrate in the joint compound composition.” *Id.* at 7:22–26. Patel discloses that particularly useful accelerators include aluminum sulfate and aluminum potassium sulfate. *Id.* at 7:39–40, 45.

Miller discloses an improved process for producing a gypsum/fiber board. Miller, [54]. The process begins with “mixing of uncalcined gypsum, cellulosic particles and water to form a dilute aqueous slurry.” *Id.* at 6:24–26. Miller discloses that the gypsum should have a relatively high purity, preferably at least about 92–96%. *Id.* at 6:27–29. The slurry is heated under conditions that cause the calcium sulfate dihydrate molecules to dissolve and convert to calcium sulfate hemihydrate molecules. *Id.* at 7:27–29. “As the conversion of the gypsum to calcium sulfate hemihydrate proceeds, saturation of the solution is reached, and the hemihydrate begins to nucleate and form crystals at a nucleation site.” *Id.* at 7:31–33. After conversion, “the slurry is dewatered to remove as much uncombined water as possible before rehydrating the calcium sulfate hemihydrate back to gypsum.” *Id.* at 8:8–9. According to Miller, “impurities from various sources in the gypsum/fiber slurry can cause the calcination process to produce short blocky

crystals that lack [sic] produce products that are relatively low in strength.” *Id.* at 10:1–3. “The aspect ratio of [the] crystals is preferably controlled by addition of a small amount of alum . . . to the gypsum/fiber slurry prior to calcination.” *Id.* at 11:7–10. Miller warns that “alum can produce some unwanted effects in the calcination step and the board-forming process. For example, the alum reacts with the carbonates that are present in some of the gypsum raw materials and the reaction forms foam that is difficult to handle in the board-forming process.” *Id.* at 11:15–18.

*Rejection of claims 1–14, 17, 21, and 22 over Halm in view of Miller and Patel*

The Examiner finds Halm discloses a composition comprising alum, a non-calcium bearing phosphate, water, and calcium sulfate hemihydrate. Final 2. The Examiner finds Halm does not disclose that the composition includes calcium carbonate. *Id.* The Examiner finds Halm discloses the composition has a viscosity of 150–500 Brabender units (BU) and includes a specific example of a composition having a viscosity of 250 BU. *Id.* at 4. The Examiner finds Miller discloses a composition comprising alum and high purity gypsum, and that Miller teaches calcium carbonate negatively reacts with alum causing the composition to foam, resulting in a material that is difficult to handle. *Id.* at 3. The Examiner finds that, based on Miller’s teaching, one of ordinary skill in the art would have used a gypsum in Halm’s composition that was substantially free of calcium carbonate in order to avoid foaming which renders the material difficult to handle. *Id.* The Examiner finds Halm and Miller do not specify the amount of alum in the composition. *Id.* The Examiner finds Patel discloses a setting-type joint compound comprising aluminum sulfate as an accelerator in an amount ranging from 0.01–2 wt%. *Id.* The Examiner finds Patel’s range includes the disclosed range of Halm, and that the ordinary artisan would have recognized that Patel discloses a workable

range of aluminum sulfate that would be suitable for use in Halm's system and method. *Id.* at 3–4.

The Examiner makes similar findings with respect to independent claim 21. *See id.* at 5–6. As to claim 21's requirement of "a double sulfate selected from the group consisting of a double sulfate of potassium and aluminum, a double sulfate of aluminum and ammonia, and a combination thereof" (Appeal Br. A-4), the Examiner finds one of ordinary skill in the art would have substituted aluminum potassium sulfate for the aluminum sulfate in Halm based on Patel's teaching that both materials function as accelerators in setting-type joint compounds. Final 6.

Appellants contend the Examiner reversibly erred in rejecting claims 1 and 21 for the following reasons: (1) "Halm fails to teach or suggest limiting the amount of calcium carbonate contaminant in the calcium sulfate hemihydrate and the total amount of calcium carbonate in the coating" (Appeal Br. 15); (2) Halm does not mix, and teaches away from mixing, aluminum sulfate with a coating (*id.* at 15–17); (3) Halm uses aluminum sulfate in an amount of from 0.01 to 0.03 wt%, which differs significantly from the claimed amount of 0.5 to 2.0 wt% (*id.* at 15); (4) Halm's disclosure of 150–500 BU viscosity compositions relates to compositions that do not include alum (*id.* at 17); (5) Miller relates to a different product (fiber boards) and a different method (calcining gypsum) than claimed and, therefore, the ordinary artisan would not have looked to Miller (*id.* at 17–18); (6) Miller teaches that a suitable amount of alum is 0.1% (no more than 0.4%) and adding a larger quantity is not practical (*id.* at 18); and (7) Patel discloses the addition of 0.01–2 wt% aluminum sulfate to a lightweight joint composition comprising calcium carbonate in an amount of 10 to 50 wt%, and does not disclose the use of a calcium-free phosphate set-preventing agent (*id.* at 18–19).

We have considered each of these arguments, but do not find them persuasive for the reasons discussed below. Any arguments made by Appellants, but not discussed explicitly in this decision, have been considered but found unpersuasive for the reasons explained in the Final Office Action and/or the Answer.

A reference qualifies as prior art for an obviousness analysis only when it is analogous to the claimed invention. *Innovation Toys, LLC v. MGA Entm't, Inc.*, 637 F.3d 1314, 1321 (Fed. Cir. 2011) (citing *In re Clay*, 966 F.2d 656, 658 (Fed. Cir. 1992)). We are not persuaded that Miller is non-analogous art (Appeal Br. 17–28) because Appellants have not explained why the Examiner’s finding that Miller is in the same field of the inventor’s endeavor, i.e., gypsum chemistry, is erroneous or unreasonable. *See* Ans. 15; Appeal Br. 18 (“Because Miller is not directed to joint compounds, it is unlikely that a person of skill would consider Miller.”); Reply Br. 10; *In re Klein*, 647 F.3d 1343, 1348 (Fed. Cir. 2011) (“Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed and, (2) if the reference is not within the field of the inventor’s endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.” (quoting *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004))); *see also Bigio*, 381 F.3d at 1326 (explaining that field of the invention must be assessed with reference to the function and structure of the invention relative to the prior art).

Appellants’ arguments that Halm fails to teach or suggest limiting the amount of calcium carbonate and that Halm uses a much smaller amount of aluminum sulfate (Appeal Br. 15) are not persuasive because Appellants fail to identify error in the Examiner’s findings and reasoning. Specifically, Appellants

have not explained why the Examiner erred in finding that the ordinary artisan would have limited the amount of calcium carbonate in Halm's system and method *based on Miller's teaching* that calcium carbonate negatively reacts with alum causing the composition to foam, resulting in a material that is difficult to handle. *See* Final 3.

Nor have Appellants persuasively explained why the Examiner erred in finding that the ordinary artisan would have understood that the higher amounts of aluminum sulfate used by Patel (i.e., preferably 0.1 to about 2.0 weight percent (Patel 7:22–24)) also could be employed in Halm's system and method. Both Halm and Patel disclose that the amount of accelerator needed to promote or accelerate the setting of the ready-mix joint compound is based on the amount of calcium sulfate hemihydrate and retarder in the composition. Halm 3:8–12; Patel 7:17–21. In other words, alum is a variable that achieves a recognized result. *See In re Applied Materials, Inc.*, 692 F.3d 1289, 1297 (Fed. Cir. 2012) (“A recognition in the prior art that a property is affected by the variable is sufficient to find the variable result-effective.”). “[D]iscovery of an optimum value of a result effective variable . . . is ordinarily within the skill of the art.” *In re Boesch*, 617 F.2d 272, 276 (CCPA 1980) (citations omitted). Further, as found by the Examiner, Patel's range overlaps with the claimed range. Final 3. “[T]he existence of overlapping or encompassing ranges shifts the burden to the applicant to show that his invention would not have been obvious.” *In re Peterson*, 315 F.3d 1325, 1330 (Fed. Cir. 2003).

We are not persuaded by Appellants' argument that Miller teaches away from adding more than 0.4% alum to Halm's system and method. *See* Appeal Br. 18. Miller discloses that “[t]ypically, about 0.10% of alum is used for rehydration of the hemihydrate to the dihydrate in the formed composite,” and that “[f]or use as

a crystal modifier . . . about 0.4% solids based on the total slurry[] is sufficient to overcome problems caused by impurities.” Miller 12:8–13. We agree with the Examiner that this disclosure would not have discouraged the ordinary artisan from using higher amounts of alum in Halm in light of Patel’s teaching that higher amounts are suitable where alum is used as an accelerator. *See Ans.* 16–17.

We also are not persuaded that the ordinary artisan would not have used the amount of aluminum sulfate disclosed in Patel in Halm’s composition because Patel discloses the “accelerator is used in combination with calcium carbonate.” Appeal Br. 18–19. Rather, we agree with the Examiner that calcium carbonate is an optional component in Patel’s composition. *Ans.* 16; Patel 3:43–45 (“In addition to the calcium sulfate hemihydrate filler, calcium carbonate may also be present as a filler.”).

Appellants contend the disclosure in Halm relied upon by the Examiner does not support the Examiner’s finding that Halm teaches mixing alum with the coating composition, and, in fact, Halm teaches away from mixing alum with the coating composition. Appeal Br. 15 (quoting Halm 3:12–15); Reply Br. 4–5 (quoting Halm 2:62–3:17). Appellants rely on the Declaration of Richard B. Stevens, dated Aug. 6, 2014 (Decl.), to support this argument. Appeal Br. 16–17; *see also* Reply Br. 6. Mr. Stevens is the named inventor in the present application and a co-inventor in Halm. Appeal Br. 13; Decl. ¶¶ 1, 3. Mr. Stevens testified that “[a]fter reading Halm, [he] would not mix aluminum sulfate with a coating composition because Halm recommends that aluminum sulfate should be applied into or on the surface of a fiberboard . . . and teaches away from mixing aluminum sulfate with the coating composition.” Decl. ¶ 7. Mr. Stevens testified that the inventors “did not intend to mix aluminum sulfate with a ready mixed setting type coating composition based on calcium sulfate hemihydrates.” *Id.* ¶ 8. Mr. Stevens

testified that “as . . . explain[ed] in the Halm patent, any inclusion of the alum into the coating would immediately initiate the setting action . . . thus making it not suitable in a continuous coating process using a reverse roll coating equipment.”

*Id.*

As explained below, we determine the claim language “wherein said alum [(claim 1)/double sulfate (claim 21)] is mixed with the joint compound base” is an intended use of the components in the claimed “joint compound system” (claims 1, 21). Therefore, this language cannot be relied upon to distinguish over the prior art joint compound systems. *See In re Pearson*, 494 F.2d 1399, 1402 (CCPA 1974) (“[T]erms [that] merely set forth the intended use for . . . an otherwise old composition . . . do not differentiate the claimed composition from those known in the prior art.”).

The Specification discloses that

[a] joint compound system for a setting-type joint compound has been developed having excellent shelf life in a ready-mixed state and fast setting times after an activating agent has been added. This system includes a set-inhibited, pre-wetted, setting-type joint compound and *a separate portion of alum that is added at the time the joint compound system is to be used.*

Spec. 5:21–26 (emphasis added); *see also id.* at 4:11–17 (“a joint compound system that includes a set-inhibited, pre-wetted, setting-type joint compound formulated with additives to allow delivery to the customer as a ready-mix joint compound, and *a separate set initiator*” (emphasis added)). Though not recited explicitly, the viscosity limitation in the final wherein clause in each of claims 1 and 21 implies that the calcium-free phosphate set-preventing agent, water, and setting type joint compound base are pre-mixed in the joint compound system. *See, e.g.,* Spec. 10:17–20, 13:5–11. Once the alum is mixed with the remaining components in the joint compound system, it forms a composition that is “capable

functioning as a setting type joint compound,” “producing a hard set article in a matter of minutes or hours.” Spec. 11:14–21. In other words, it would be unreasonable to interpret the claim language as requiring that the alum is mixed with the joint compound base and remaining recited components in the claimed “joint compound system.”

In any event, even if the claims were interpreted as requiring that the alum is mixed with the joint compound base, Appellants have not identified reversible error in the Examiner’s conclusion of obviousness as to claims 1 and 21. We agree with the Examiner that Mr. Stevens’s testimony is not persuasive evidence of patentability. Ans. 13. As explained by the Examiner, the subjective intent of the inventors is not the measure of what their patent disclosure would have conveyed to the ordinary artisan at the time of the invention. *Id.*; *cf. Wyers v. Master Lock Co.*, 616 F.3d 1231, 1242 (Fed. Cir. 2010) (explaining that whatever the inventor did or did not personally realize at the time based on his actual knowledge is irrelevant—the relevant inquiry is what a hypothetical ordinarily skilled artisan would have gleaned from a cited references at the time that the patent application was filed). Moreover, Mr. Stevens’s testimony is unpersuasive because he fails to identify supporting evidence. *See In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1368 (Fed. Cir. 2004) (explaining that the Board is entitled to weigh declarations expressing opinions as to fact and conclude that the lack of factual corroboration warrants discounting the opinions expressed in the declarations); *cf. In re Bulina*, 362 F.2d 555, 559 (CCPA 1966) (“[A]n affidavit by an applicant or co-applicant as to the advantages of his invention is less persuasive than one made by a disinterested person.”).

We have reviewed the cited disclosure in Halm and concur in the Examiner’s reading of Halm as disclosing that alum may be *either* mixed with the

coating composition and then applied to the fiberboard, *or* present on the surface of the fiberboard prior to applying the coating composition. *See* Ans. 13; Halm 3:13–17 (“Using a very active set initiator such as aluminum sulfate has the advantage of rapidly hydrating the calcium sulfate hemihydrate so that it *does not need to be mixed* with the coating composition, but *may be merely on the surface* of the fiberboard.” (emphasis added)); *see also* Halm 4:66–5:3, 5:11–23. Halm, at most, expresses a preference for applying the alum to the surface of the fiberboard to avoid a step of mixing the alum with the coating composition. *See Syntex (U.S.A.) LLC v. Apotex, Inc.*, 407 F.3d 1371, 1379–80 (Fed. Cir. 2005) (“A statement that a particular combination is not a preferred embodiment does not teach away absent clear discouragement of that combination.”).

In addressing the Stevens Declaration, the Examiner disagrees with Dr. Stevens’s opinion that Halm does not disclose a joint compound as claimed, but relates to coating compositions applied over fiberboards (Decl. ¶ 5). Ans. 13. In the Reply Brief, Appellants argue that joint compounds and coating compositions “are different products with different chemical compositions and they differ in various properties, including viscosity, setting time, shrinkage, workability, working time, and application.” Reply Br. 8. Appellants do not provide persuasive evidence to support these assertions, however. Moreover, Halm explicitly refers to the “joint compounds of the invention” (Halm 4:45–46) and uses the term “coating composition” interchangeably with the term “joint compound” (*id.* at 4:37–42). *See* Ans. 14.

Finally, as to Appellants’ argument that the compositions in Halm having a viscosity of 150–500 BUs do not comprise alum (Appeal Br. 17), we find the Examiner has provided sufficient evidence to support a finding that the combination of Halm, Miller, and Patel would have resulted in a composition as

claimed and, therefore, reasonably would have been expected to exhibit the same viscosity as the claimed composition. *See* Ans. 14–15.

Appellants also rely on secondary considerations of non-obviousness. Specifically, Appellants argue the “an inventive joint compound as recited by the pending claims provides significant advantages over joint compounds conventionally known in the art.” Appeal Br. 19. Appellants contend the examples in Specification Table II demonstrate that “if alum is added to a joint compound with calcium carbonate, a person of skill obtains a defective product with inferior properties” as compared to a product produced using the claimed joint compound system. *Id.* Specification Table II (Spec. 14) provides a comparison of performance data for a conventional joint compound (“control”) containing 16.82 wt% of added calcium carbonate with the inventive joint compound containing no added calcium carbonate, but containing 16.82 wt% talc (*see id.* at 12, Table I). 0.60 g, 0.80g, and 1.75 g of alum were added to separate, 100 gram samples of the control and inventive joint compounds to form six samples. *See id.* at 14, Table II. Set times and mixing properties of the three control samples and the three inventive samples were compared. *Id.* According to the Specification, faster set times were obtained with the inventive joint compound and, in contrast to the control compound, no foam was generated and the product did not expand. *Id.* at 14:1–4, 7–8.

Appellants’ comparative testing is not persuasive evidence of nonobviousness because it is not commensurate in scope with the claims. *See In re Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011). The claims specify that the joint compound base comprise “calcium sulfate hemihydrate having less than about 2% by weight contaminant calcium carbonate” and “no added calcium carbonate.” Appeal Br. A-1, A-4 (claims 1 and 21). Appellants’ control joint compound contained 16.82 wt% added calcium carbonate. Spec. 12, Table 1. There is no

comparison, however, of the inventive joint compound with a compound containing a much smaller amount of added calcium carbonate, e.g., 1.0 wt% or less. Nor have Appellants demonstrated that a compound within the scope of the claims, but containing different additives, would be expected to exhibit the same type of improved properties as compared to a control compound containing calcium carbonate. Further, Appellants have not shown criticality in the claimed range of alum (claim 1)/double sulfate (claim 21). In other words, Appellants have not tested joint compounds containing alum in amounts just outside the claimed range. *See In re Inland Steel Co.*, 265 F.3d 1354, 1366 (Fed. Cir. 2001).

In sum, for the reasons stated in the Final Office Action, the Answer, and above, we determine a preponderance of the evidence, taking into account Appellants' evidence of unexpected results, weighs in favor of the Examiner's conclusion of obviousness. The rejection of claims 1–14, 17, 21, and 22 over Halm in view of Miller and Patel is sustained.

*Rejection of claims 16 and 23 over Halm  
in view of Miller, Patel, and Williams*

Appellants argue Williams fails to cure the deficiencies in the combination of Halm, Miller, and Patel. Appeal Br. 20. As discussed above, we are not persuaded of error in the Examiner's rejection of claims 1 and 21 from which claims 16 and 23 depend, respectively. The rejection of claims 16 and 23 over Halm in view of Miller, Patel, and Williams is sustained.

*Rejection of claims 14, 15, and 22 over Halm  
in view of Miller, Patel, and Espinoza*

Claims 14 and 22 recite that the joint compound system of claims 1 and 21, respectively, further comprises a pH control additive for maintaining pH within a range of about 7 to 8. Appeal Br. A-3–A-4. Claim 15 depends from claim 1 and recites that the joint compound system further comprises a wetting agent “in an

amount from about 0.05% to about 1.0% weight of said base composition excluding water.” *Id.* at A-3.

The Examiner finds “Halm teaches that citric acid may be used in an amount from 0.1–0.25 wt%, but . . . is silent to its use as a pH agent.” Final 8. The Examiner finds Espinoza discloses the desirability of a pH range of 7–8 for ready mix joint compounds and that such pH can be achieved by using 0.1–1 wt% citric acid in the joint compound. *Id.* The Examiner finds Halm discloses that wetting agents may be used in the composition but fails to disclose the amount in which they can be added. *Id.* The Examiner finds one of ordinary skill in the art would have added the wetting agent in an amount of 0.05 to about 1.0 wt% based on Espinoza’s teaching that a wetting agent may be used in a joint compound in minor amounts ranging from about 0.05 to about 1 wt% prior to adding water. *Id.*

Appellants argue Espinoza fails to cure the deficiencies in the combination of Halm, Miller, and Patel, and that Espinoza discourages the use of aluminum sulfate in combination with calcium carbonate. Appeal Br. 21. Appellants’ arguments are not persuasive of error in the Examiner’s conclusion of obviousness.

As discussed above, we are not persuaded of error in the Examiner’s rejection of claims 1 and 21 from which claims 14 and 15, and claim 22 depend, respectively. Appellants’ assertion that Espinoza discourages the use of aluminum sulfate in combination with calcium carbonate fails to identify error in the Examiner’s reliance on Espinoza for a teaching of adjusting pH using citric acid and including a wetting agent in the claimed amount. The rejection of claims 14, 15, and 22 over Halm in view of Miller, Patel, and Espinoza is sustained.

*Rejection of claims 1–17, 21, and 23 over Patel in view of Miller and Halm*

The Examiner finds Patel discloses a composition comprising alum in an amount of 0.1–2 wt%, water, and calcium sulfate hemihydrate that does not

include additional calcium carbonate. Final 9. The Examiner finds Patel fails to disclose the use of a calcium-free phosphate agent and a calcium sulfate that has less than about 2 wt% contaminant calcium carbonate. *Id.* The Examiner finds one of ordinary skill in the art would have included a non-calcium bearing phosphate retarder in Patel's composition to grant enhanced, set-preventing characteristics, as taught by Halm. *Id.* The Examiner finds that, based on Miller's teaching, one of ordinary skill in the art would have used a gypsum in Halm's composition that was substantially free of calcium carbonate in order to avoid foaming which renders the material difficult to handle. *Id.* at 9–10. The Examiner makes similar findings as to claim 21, noting that Patel expressly discloses the use of a double sulfate of potassium and aluminum. *See id.* at 11–12.

Appellants contend the Examiner reversibly erred in rejecting claims 1 and 21 for the following reasons: (1) Patel discloses the use of calcium carbonate as a filler and, therefore, does not disclose a joint compound base having no added calcium carbonate/less than about 2% by weight of contaminant calcium carbonate (Appeal Br. 22); and (2) Miller teaches that a suitable amount of alum is 0.1% (no more than 0.4%) and adding a larger quantity is not practical (*id.* at 23). Appellants also argue the claimed composition and method exhibit unexpected results as compared to the prior art compositions. Appeal Br. 23 (“As shown [in] the Examples, an inventive joint compound according to the pending claims performs significantly better in a number of tests in comparison to the control conventional compound.”).

Appellants made the same arguments in traversing the rejection of claims 1–14, 17, 21, and 22 over Halm in view of Miller and Patel. These arguments were fully addressed above and are likewise unpersuasive of error in the Examiner's

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rejection of claim 1–17, 21, and 23 over Patel in view of Miller and Halm. The rejection is sustained.

**ORDER**

We AFFIRM the Examiner’s decision to reject claims 1–17 and 21–23.

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

**AFFIRMED**