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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte REFAT AHMED IBRAHIM EL-SHEIKHY and MOSLEH ALI AL-SHAMRANI

Appeal 2020-001382
Application 15/343,166
Technology Center 3700

Before DANIEL S. SONG, CARL M. DEFRANCO, and BRANDON J. WARNER, *Administrative Patent Judges.*

SONG, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), the Appellant appeals from the Examiner's decision to reject claims 1, 2, 4–8, 11, and 12.[1] We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] We use the word Appellant to refer to "applicant" as defined in 37 C.F.R. § 1.42(a). The Appellant identifies King Saud University as the real party in interest. Appeal Br. 3.

CLAIMED SUBJECT MATTER

The claims are directed to a method of extinguishing or retarding fire using nano-clay.[2] Claim 1, reproduced below, is illustrative of the claimed subject matter:

> 1. A method of extinguishing or retarding fire, comprising:
>
> obtaining a quantity of powdered montmorillonite-based nano-clay, the montmorillonite-based nano-clay including nanoparticles having a particle size of about 1 nm to about 50 nm;
>
> storing the powdered montmorillonite-based nano-clay in a container; and
>
> dispensing the powdered montmorillonite-based nano-clay from the container onto said fire for retarding or extinguishing the fire.

Appeal Br. 12, Claims App.

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Kaminstein	US 3,976,580	Aug. 24, 1976
Mulukutla	US 7,661,483 B2	Feb. 16, 2010

OPINION

The Examiner rejects claims 1, 2, 4–8, 11, and 12 as being unpatentable over Mulukutla in view of Kaminstein. Final Act. 2–5. As to independent claim 1, the Examiner finds that Mulukutla discloses the method of extinguishing or retarding fire using nano-particles of about 1–50 nm in size, substantially as claimed, but fails to disclose that the nano-particles are a powdered montmorillonite-based clay. Final Act. 2. The

[2] Throughout the record, "nano-clay" is also referred to as "nanoclay."

Examiner relies on Kaminstein for disclosing "a method of retarding a fire using particles wherein the particles used are a powdered montmorillonite-based clay." Final Act. 2 (citing Kaminstein, col. 3, ll. 26–28; col. 2, ll. 36–39). The Examiner concludes that it would have been obvious to one of ordinary skill in the art to have modified Mulukutla in view of Kaminstein to use "a powdered montmorillonite-based clay as a substitute for the retardants disclosed by Mulukutla, in order to provide for a component that is effective in retarding flame growth." Final Act. 2–3.

The Appellant argues all of the claims as a group, only submitting arguments for independent 1, and stating that claims 2, 4–8, 11, and 12 stand or fall with claim 1. Appeal Br. 7. The Appellant argues that the rejection is flawed because it is "based on the belief that nanocrystalline particles of clay are the claimed 'nanoclays.' . . . Conventional clay is NOT 'nanoclay' even if the former's particle size is of a nanoscale." Appeal Br. 9. The Appellant argues that the prior art relied upon in the rejection does not disclose a "nanoclay," and that "[t]he Examiner's refusal to accept the industry's nomenclature and definition *is the issue* in the instant Appeal." *See* Appeal Br. 9; Reply Br. 5 (emphasis added).

In particular, the Appellant asserts the term "nanoclay" is "a recognized term of art with recognized meaning and morphology" shown in Figures 1A–1D. Appeal Br. 8. The Appellant asserts that the evidence of record, also submitted in the Evidence Appendix, establishes "the difference between conventional powdered clay soils (bentonite or montmorillonite) and bentonite- or- montmorillonite-based nanoclays," and that "the properties of 'nanoclays' are different than the properties of micro-sized clay." Appeal Br. 9; *see also* Reply Br. 6. According to the Appellant,

"'[n]anoclay' requires a complicated process to exfoliate the micro particles to nano layers, then particles[,] and is in the nanometer range; furthermore, the nanoclays have either a platey structure (bentonite or montmorillonite) or nanotube structure (halloysite clay)." Appeal Br. 8–9. Based thereon, the Appellant further argues that "[a] person of ordinary skill in the art interpreting [c]laim 1 in light of the [S]pecification would realize that the term 'nanoclay' refers to *a surface modified montmorillonite; that is, nanoclay is synthesized*, while clays are naturally occurring materials." Appeal Br. 8 (emphasis added); *see also* Appeal Br. 9 ("'[N]anoclays' are synthesized, while the prior art clays are merely natural, powdered clays.").

The Examiner disagrees and determines that "nano-clay is not a term of art, limited to synthetic nano-clay. Nano-clay is also naturally occurring." Ans. 4. The Examiner explains that "[t]o interpret the claims as putting forth nano-clay from only synthetic sources, would be an unreasonably narrow interpretation, in light of the [S]pecification," which "puts forth a method that may include not only synthesized nano-clay, but also natural nano-clay." Ans. 4 (citing Spec. ¶ 11), and 5 ("Synthetic sourcing is not to be read into claim language."). The Examiner further explains that, because the Appellant's Specification also encompasses naturally occurring nano-clays, and does not disclose "what synthetic process is [] performed," and the Appellant does not specifically claim only synthetic nano-clays, the broader interpretation of claim 1 is reasonable. Ans. 4.

Regardless of whether the term nano-clay is "a term of art," the Examiner has the better position as to what nano-clay, as recited in claim 1, encompasses. In particular, although the Appellant relies on its submitted evidence, this evidence appears to support the Examiner's interpretation, or

at best, is ambiguous. Specifically, *Nano Minerals: Nanoclays* (Appeal Br., Evidence App., Exhibit A, hereinafter "*Nano Minerals*") discloses that "nanoclays are organized into several classes such as montmorillonite, bentonite, kaolinite, hectorite, and halloysite." It then discloses that "[p]late-like montmorillonite is the most common nanoclay used in materials applications." *See Nano Minerals*. Another submitted evidence *Nanocor, Nanoclay Structures* (Appeal Br., Evidence App., Exhibit B, hereinafter "*Nanocor*") discloses that "[t]he essential nanoclay raw material is montmorillonite. . . . Naturally occurring montmorillonite is hydrophilic. Since polymers are generally organophilic, unmodified nanoclay disperses in polymers with great difficulty." *Nanocor*.

Thus, *Nano Minerals* discloses that montmorillonite is a "nanoclay" in that montmorillonite is disclosed as being a "class" of nanoclays. *Nano Minerals*. This evidence also discloses that montmorillonite has a plate-like structure. *Id*. The *Nanocor* evidence discloses that montmorillonite is naturally occurring. In addition, the Appellant's own Specification states that "[t]he nano-clay can be obtained from natural or synthetic sources." Spec. ¶ 11.

The Appellant's argument based on nanoclays having "either a platey structure (bentonite or montmorillonite) or nanotube structure (halloysite clay)" is unpersuasive considering that *Nano Minerals* discloses that montmorillonite is a nanoclay having a plate-like structure, such that this structure fails to distinguish the naturally occurring montmorillonite from allegedly claimed "surface modified montmorillonite; that is, nanoclay [that] is synthesized." Appeal Br. 8–9. In essence, the Appellant unpersuasively argues that "nanoclay" recited in claim 1 should be narrowly interpreted to

mean "synthesized" nanoclay or "surface modified" nanoclay, which has undergone a "complicated process," without claiming such synthesis, modification, or complicated processing. Accordingly, the Examiner's interpretation of "nanoclay" recited in claim 1 to encompass naturally occurring nanoclays, instead of being limited to synthetic nanoclays, is supported by substantial evidence, and is reasonable.

The Appellant responds that "the term 'nanoclay' describes a specialized form of clay whether it's in its natural or synthetic embodiment." Reply Br. 6. Notwithstanding that this appears to be a new argument, it is unpersuasive for the reasons already discussed in that the evidence of record indicates that nanoclay is naturally occurring, and the claim does not recite any limitations as to the "specialized form of clay" that would distinguish the claimed nanoclay from that occurring naturally.

The Appellant further argues that "[t]he flaw in the Examiner's rejection is based on the assumption that Kaminstein's montmorillonite clay that, in powder form, has a particle size of about 20-50 microns, is the claimed 'nanoclay'. . . . Natural montmorillonite clay used by Kaminstein is in micro size and, therefore, is not the claimed 'nanoclay.'" Appeal Br. 9. In addition, according to the Appellant, Kaminstein discloses particles that are "neither nano-sized nor composed of platelets; that is, a 'particle' is not a 'platelet' that is a requirement to be considered a 'nanoclay.'" Reply Br. 6 (citing Kaminstein, col. 2, ll. 46–47). Thus, according to the Appellant, the combination of Mulukutla and Kaminstein "still lacks the use of 'nanoclay.'" Appeal Br. 9; *see also* Reply Br. 7.

However, these arguments are unpersuasive because, not only is platelet not recited in claim 1, but the evidence indicates that

montmorillonite has a plate-like structure. *See generally Nano Minerals*. In addition, in contrast to the Appellant's assertion, Kaminstein does not disclose particles of 20–50 microns, which sets the minimum size at 20 microns, but instead, discloses "an average particle size less than about 20 microns," such that 20 microns is the maximum size. Kaminstein, col. 2, ll. 47–48. Furthermore, the rejection is not based on Kaminstein alone, but instead, also relies on Mulukutla for its disclosure of nano-particles sized in the range claimed for retarding or extinguishing fire. Final Act. 2 (citing Mulukutla, col. 3, ll. 60–63 (disclosing nanocrystalline particles between about 1–20 nm)); *see also* Mulukutla, Abstract; and Ans. 4–5.

Thus, the Examiner's position that the "combination suggests a powdered montmorillonite-based clay with nano-sized particles used as fire retardant" (Ans. 5), is sufficiently supported by the evidence to establish a prima facie case of obviousness. Although the Appellant argues that "[t]he Examiner's contention that nano-sized particles make the clay 'nanoclay' is in error" (Appeal Br. 10), the evidence and arguments provided by the Appellant is unpersuasive for the reasons discussed above. Accordingly, we are not persuaded that the Examiner erred in concluding that "one having ordinary skill in the art would find motivation to combine the disclosures of Mulukutla and Kaminstein, arriving at a montmorillonite-based clay retardant with *nano-sized particles*, in order to retard flame growth." Ans. 4. We affirm the Examiner's rejection of claim 1, and claims 2, 4–8, 11, and 12, fall with claim 1.

CONCLUSION

The Examiner's rejection of claims 1, 2, 4–8, 11, and 12 is affirmed.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 2, 4–8, 11, 12	103	Mulukutla, Kaminstein	1, 2, 4–8, 11, 12	

TIME PERIOD FOR RESPONSE

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

AFFIRMED