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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte NATHAN M. SEIDNER, JAY D. SHULER,
and RICHARD BRAD CRAGUN

Appeal 2019-005834
Application 13/832,960
Technology Center 1700

Before MAHSHID D. SAADAT, DONNA M. PRAISS, and
BRIAN D. RANGE, *Administrative Patent Judges*.

SAADAT, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant¹ seeks our review under 35 U.S.C. § 134(a) from a Non-final rejection of claims 1–5, 7–9, 12–14, and 21.² We have jurisdiction under 35 U.S.C. § 6(b).

We affirm in part.

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as Northrop Grumman Innovation Systems, Inc. Appeal Br. 1.

² Claims 6, 10, 11, and 16 have been canceled and claims 15 and 17–20 have been withdrawn from consideration.

STATEMENT OF THE CASE

The Invention

According to the Specification, the invention relates to “precursor formulations for use as an energetic material that includes high surface area carbon black, wherein the energetic material reduces the likelihood of premature ignition or explosion due to electrostatic charge buildup during manufacture, transportation, storage, or use.” Spec. ¶ 1.

Exemplary Claim

Independent claim 1 exemplifies the claims at issue and reads as follows:

1. A precursor formulation of a propellant composition comprising:
at least one of a fuel or an oxidizer;
a binder consisting of a hydroxyl terminated polybutadiene (HTPB); and
a conductive, amorphous carbon black having a specific surface area of at least about 1,200 m²/g, the conductive, amorphous carbon black comprising from about 0.05% by weight to about 0.25% by weight of a total weight of the propellant composition.

Appeal Br. 30 (Claims App.).

The Rejection on Appeal

Claims 1–5, 7–9, 12–14, and 21 stand rejected under 35 U.S.C. § 103 as unpatentable over Boyd (US 2003/0041935 A1; pub. Mar. 6, 2003) and Pile (US 2005/0189053 A1; pub. Sept. 1, 2005). Non-final Act. 2–4.³

³ The Non-final Rejection of claims 1–5, 7–9, 12–14, and 21 under 35 U.S.C. § 112(a) was withdrawn by the Examiner. Ans. 5.

ANALYSIS

We have reviewed the rejection in light of Appellant's arguments that the Examiner erred. For the reasons explained below, we concur with the Examiner's conclusion concerning unpatentability under U.S.C. § 103 except where we otherwise indicate. Where we affirm, we adopt the Examiner's findings and reasoning in the Non-final Office Action and Answer. *See* Non-final Act. 2–4; Ans. 5–7. We add the following to address and emphasize specific findings and arguments.

CLAIM 1

Combination of Boyd and Pile

As noted above, the U.S.C. § 103 rejection of claim 1 is based on Boyd for disclosing the recited fuel or oxidizer and binder portion of a precursor formulation and further on Pile's teaching to use carbon black with the recited surface area. *See* Non-final Act. 2–3. Appellant argues that the Examiner erred in rejecting claim 1 because "the Examiner's reasoning is conclusory and does not constitute an objective reason that supports modifying the propellant of Boyd to replace its optional powdered carbon with the carbon black of Pile." Appeal Br. 17. According to Appellant, although Pile teaches that using carbon black provides electrical conductivity to the priming mixture, there is no "objective reason to a person of ordinary skill in the art to modify Boyd as asserted by the Examiner." Appeal Br. 18. Appellant asserts that the Examiner improperly attempts to remedy the deficiency of Boyd by offering the following reasoning:

Given the differences between electrical conductivity properties and opacifier or ballistic modifier properties, a person of ordinary skill in the art would not have an objective reason to replace an opacifier or ballistic modifier in one composition

with an electrically conductive component of another composition, let alone for the reasons asserted by the Examiner, when there is no teaching or suggestion in the composition to be modified that electrical conductivity is desirable.

Appeal Br. 18–19.

We are unpersuaded by Appellant’s arguments. As stated by the Examiner, Boyd and Pile both disclose propellant systems that include carbon black, which may be modified to achieve the benefit taught by Pile. Ans. 5 (citing Boyd ¶ 5; Pile ¶¶ 2, 35). In addition, the Examiner’s finding that Boyd’s carbon black may be substituted with Pile’s carbon black is further supported by Boyd’s powdered carbon description as “any finely divided form of carbon, including the various types of carbon black as well as charcoal.” Boyd ¶ 38. Based on these findings, the preponderance of evidence supports the Examiner’s determination that it would have been obvious to one of ordinary skill in the art to substitute Boyd’s carbon black with Pile’s carbon black, particularly in view of Pile’s teaching that increasing surface area of the carbon black particles improves electrical conductivity, thus improving ignitability. Ans. 5 (citing Pile ¶ 35; teaching surface area of greater than about 1000 m²/g or of about 1475 m²/g).

Thus, as the Examiner properly reasons, the combination of Boyd with Pile would have been obvious to improve Boyd’s precursor formulation of the propellant for a gun system with improved and added properties of Pile for priming mixes of small arms ammunition. Non-final Act. 3; Boyd ¶ 5; Pile ¶¶ 2, 35.

Teaching Away

Appellant advances another reason why the combination is improper—“modifying the propellant of Boyd, where the powdered carbon

is used as an opacifier or ballistic modifier, does not flow naturally from Pile, where the carbon black provides electrical conductivity.” *See* Appeal Br. 19. According to Appellant, “[a] person of ordinary skill in the art, upon reading Boyd and Pile, would be taught away from using the carbon black of Pile in the composition of Boyd.” *Id.*

We disagree that Pile teaches away from the proposed combination to meet claim 1’s subject matter. “A reference does not teach away . . . if it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the invention claimed.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)). Nevertheless, “even if a reference is not found to teach away, its statements regarding preferences are relevant to a finding regarding whether a skilled artisan would be motivated to combine that reference with another reference.” *Polaris Indus. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1069 (Fed. Cir. 2018) (citing *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1051 n.15 (Fed. Cir. 2016) (en banc)).

Here, Appellant does not show how Boyd or Pile “criticize[s], discredit[s], or otherwise discourage[s]” investigation into claim 1’s subject matter. *See* Appeal Br. 20–21; Reply Br. 5–7. To the contrary, as discussed above, Boyd discloses (1) a solid propellant composition including carbon black, (2) at least one of a fuel or oxidizer, and (3) a binder. *See* Boyd ¶¶ 5, 24, 38, 44; Non-final Act. 2; Ans. 5–6. Additionally, Pile teaches the specific surface area of the carbon black component for achieving improved conductivity, i.e. improved ignitability, in a propellant ignition system. *See* Pile ¶¶ 2, 35; Non-final Act. 3–4; Ans. 5–6. Hence, neither Boyd nor Pile

teaches away from claim 1's subject matter, rather, they disclose alternatives which do not criticize, discredit, or otherwise discourage the solution claimed.

Unexpected Results

Appellant contends the claimed subject matter would not have been obvious because “[i]t was unexpected that the propellant compositions formed from precursor formulations with the high surface area carbon black exhibited lower relaxation times by several orders of magnitude compared to the propellant composition formed from precursor formulations with the low surface area carbon black.” Appeal Br. 21–22. Appellant specifically argues

The propellant compositions formed from precursor formulations with the high surface area carbon black exhibited the lower relaxation times while also exhibiting comparable breakdown voltages to the propellant compositions formed from precursor formulations lacking carbon black and to the propellant composition formed from precursor formulations with the low surface area carbon black. It was unexpected that these improvements in electrostatic charge dissipation properties were achieved without affecting the breakdown voltage properties, processing, or rheology of the propellant compositions. For instance, the propellant compositions formed from precursor formulations with the high surface area carbon black did not exhibit inferior properties in processing and rheology.

Appeal Br. 22. Additionally, Appellant asserts:

The Examiner has not identified how or why the propellant compositions described in ¶¶ [0024]–[0027], Table 1, and FIGs. 1 and 2 of the as-filed application and relied upon as providing evidence of unexpected results do not establish unexpected and unobvious differences between the compositions formed from precursor formulations of the claimed invention and propellant

compositions formed from precursor formulations including low surface area carbon black or lacking carbon black.

Appeal Br. 23.

The Examiner responds by stating that the proposed combination of Boyd with Pile would result in high surface area carbon black included in the propellant composition “and thus would be expected to have the same or similar properties relating to relaxation times and electrostatic charge.” Ans. 6. The Examiner further explains “Pile discloses that the inclusion of the high surface area carbon black results in improved electrical conductivity.” Ans. 7 (citing Pile ¶¶ 35, 36). In addition, the Examiner finds Appellant’s referenced unexpected results include additional components, therefore the properties are not commensurate in scope with the claims. *Id.*

Appellant does not persuade us that the submitted evidence of unexpected results are sufficient to outweigh the prior art evidence of obviousness presented by the Examiner. *See* Appeal Br. 22–23 (citing Spec. ¶¶ 24–27, Table 1, Figs. 1, 2); Reply Br. 7–9. In particular, we agree with the Examiner’s determination that Appellant’s evidence of unexpected results is not commensurate in scope with the subject matter encompassed by claim 1. *See* Ans. 7.

The Specification describes a comparison of different combinations of surface area and the relaxation time. *See* Spec. ¶ 24. The Specification further describes the propellant composition including high surface carbon black, lacking carbon black, and low surface carbon black. *See* Spec. ¶ 26, Table 1. Although we acknowledge the Specification’s assertion regarding the unexpectedness of the results shown in Table 1 and paragraphs 24–27 of the Specification, Appellant’s claim 1 encompasses specific surface area and

weight ranges. *See* Appeal Br. 30 (representative claim 1 recites carbon black having a surface area of at least about 1,200 m²/g, and about 0.05% by weight to about 0.25% by weight of a total weight of the propellant composition). Because the data supporting the Specification's assertion of unexpectedness is limited to compositions containing relatively low surface area, whereas Appellant's claim 1 encompasses surface area significantly higher than those upon which the assertions of unexpectedness are based, we agree with the Examiner that the evidence of unexpectedness advanced by Appellant is not commensurate in scope with the subject matter recited in claim 1.

Additionally, the cited references disclose the required carbon black having a surface area of at least 1200 m²/g (Pile ¶ 35; surface area of about 1475 m²/g). Moreover, Pile discloses "carbon black can be utilized in various amounts, including from about 0.5% to about 2% carbon black, although amounts outside this range can function also." Pile ¶ 34; *see also* Boyd ¶ 38 (carbon at less than 2% weight). It is well settled that the disclosure of a range in the prior art which substantially overlaps a claimed range is generally sufficient in and of itself to render the claimed range *prima facie* obvious. *See In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990); *In re Wertheim*, 541 F.2d 257, 262 (CCPA 1976); *In re Malagari*, 499 F.2d 1297, 1302 (CCPA 1974). This is especially true here, where one having ordinary skill in the art would have been led to a precursor formulation of a propellant composition wherein carbon black surface area and weight fall within the recited values as suggested by the combination of Boyd and Pile and as determined by the Examiner. Non-final Act. 2–3.

Summary for Claim 1

In sum, for the reasons discussed, Appellant does not persuade us that the Examiner erred in determining that Boyd and Pile would have suggested the subject matter of claim 1. In our view, the claimed subject matter exemplifies the principle that “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). For the reasons discussed, Appellant also does not persuade us that it has advanced evidence of unexpected results sufficient to outweigh the prior art evidence of obviousness presented by the Examiner in relation to claim 1.

CLAIMS 8, 9, and 14

Appellant does not argue patentability separately for claims 8, 9, and 14 and relies on the arguments presented for claim 1. *See* Appeal Br. 24. Thus, we sustain the U.S.C § 103 rejection of these claims for the same reasons as claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

CLAIM 21

Appellant contends “Boyd and Pile, alone or in combination, do not teach or suggest the element in claim 21 of a precursor formulation of a propellant composition consisting of, *inter alia*, ‘at least one of a bonding agent, a plasticizer, or a crosslinking agent.’” Appeal Br. 24. According to Appellant, neither reference teaches or suggests this feature because Boyd includes iron oxide, silica, ammonium perchlorate, and a crosslinkable binder and Pile teaches that the required primary oxidizer is a primary explosive and bismuth oxide, which are not characterized as a bonding agent, a plasticizer, or a crosslinking agent. Appeal Br. 24–25. Appellant

further presents arguments regarding the reason to combine Boyd and Pile and the claimed invention exhibiting unexpected results, which we find unpersuasive of error for the reasons addressed above with respect to claim 1. *See* Appeal Br. 26–28.

The Examiner responds by stating that Boyd discloses “[o]ther components which may be included in the compositions of the invention include powdered carbon, powdered aluminum, plasticizers, bonding agents and antioxidants.” Ans. 6 (citing Boyd ¶ 24). The Examiner finds Boyd’s claim 44 describes a curing agent used for crosslinking the binder, which is the same as the recited crosslinking agent. *Id.* Regarding the closed claim language “consisting of,” the Examiner determines that the claim is directed to a “precursor” of a propellant and that additional components added to make a final propellant are not excluded by the claim. *Id.*

We are persuaded by Appellant that the Examiner reversibly erred in rejecting claim 21 over the combination of Boyd and Pile. The Examiner correctly describes claim 21 as being directed to a “precursor” rather than a final propellant composition, but does not make any further findings regarding whether Boyd’s iron oxide and silica or Pile’s primary explosive and bismuth oxide are “precursor” components or additional components added to a “precursor” of a final propellant composition. In the absence of such findings, we are constrained to reverse the rejection of claim 21 over the combination of Boyd and Pile.

Summary for Claim 21

For the reasons discussed above, Appellant’s arguments have persuaded us that the Examiner erred in rejecting claim 21 for obviousness

based on Boyd and Pile. Thus, we reverse the U.S.C. § 103 rejection of claim 21.

CLAIMS 15 and 17–20

Appellant does not argue patentability separately for claims 15 and 17–20 and relies on the arguments presented for claim 1. *See* Appeal Br. 28. Thus, we sustain the U.S.C. § 103 rejection of these claims for the same reasons as claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

REJOINDER OF CLAIMS 15, 17–20

Appellant’s assertion regarding the rejoinder of claims 15 and 17–20 upon the allowance of generic claim 1, is not ripe to be considered before this panel. We leave it to the Examiner to consider the propriety of the rejoinder of claims after allowable subject matter is determined.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–5, 7–9, 12–14, 21	103	Boyd, Pile	1–5, 7–9, 12–14	21
Overall Outcome			1–5, 7–9, 12–14	21

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)(1)(iv). *See* 37 C.F.R. § 41.50(f).

AFFIRMED IN PART