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OSHA, LIANG LLP / SMITH
TWO HOUSTON CENTER
909 FANNIN STREET, SUITE 3500
HOUSTON, TX 77010

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DAVIS, SHENG HAN

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte GREGORY T. LOCKWOOD and JONAN FULENCHEK

Appeal 2015-004047
Application 11/937,969
Technology Center 1700

Before JEFFREY T. SMITH, N. WHITNEY WILSON,
and MICHAEL G. McMANUS, *Administrative Patent Judges*.

McMANUS, *Administrative Patent Judge*.

DECISION ON APPEAL

The Examiner finally rejected claims 2–21 and 25–29 of Application 11/937,969 under 35 U.S.C. § 103(a) as obvious. Final Act. (Feb. 3, 2014). Appellants¹ seek reversal of these rejections pursuant to 35 U.S.C. § 134(a). We have jurisdiction under 35 U.S.C. § 6.

For the reasons set forth below, we AFFIRM.

¹ Smith International, Inc. is identified as the real party in interest. Appeal Br. 4.

BACKGROUND

The present application describes a drill bit having multiple ribs impregnated with two or more types of abrasive particles each encapsulated in a matrix. Spec. 6–7.

Claim 14 is representative of the pending claims and is reproduced below:

14. A drill bit, comprising:

a bit body; and

a plurality of diamond impregnated ribs formed in the bit body and separated by channels, wherein at least one diamond impregnated rib comprises:

a plurality of first encapsulated particles, each first encapsulated particle comprising a first abrasive particle encapsulated by a first matrix material shell;

a plurality of second encapsulated particles, each second encapsulated particle comprising a second abrasive particle encapsulated by a second matrix material shell, wherein the first encapsulated particles and the second encapsulated particles comprise at least one property difference therebetween.

Appeal Br. 26–27 (Claims App.).

REJECTIONS

On appeal, the Examiner maintains the following rejections:

1. Claims 2–5, 7–11, 14, 15, 17, 25, and 28 are rejected under 35 U.S.C. § 103(a) as obvious over Wilder et al. (US 3,841,852, iss. Oct. 15, 1974) (“Wilder”) in view of Alsup (US 6,095,265, iss. Aug. 1, 2000) (“Alsup”) and further in view of Boyce (US 6,138,779, iss. Oct 31, 2000) (“Boyce”). Final Act. 8; Answer 2, 6.
2. Claims 6, 12, 13, 16, 21, and 27 are rejected under 35 U.S.C.

§ 103(a) as obvious over Wilder in view of Alsup and further in view of Smith et. al. (US 7,048,081 B2, iss. May 23, 2006) (“Smith”). Final Act. 14.

3. Claims 18 and 29 are rejected under 35 U.S.C. § 103(a) as obvious over Wilder in view of Alsup and Mudholkar et al. (US 2004/0137229 A1, pub. Jul. 15, 2004) (“Mudholkar”), and further in view of Viel et al. (US 2006/0283637 A1, pub. Dec. 21, 2006) (“Viel”). Final Act. 16.

4. Claims 19, 20 and 26 are rejected under 35 U.S.C. § 103(a) as obvious over Wilder in view of Alsup, Mudholkar, and Viel, and further in view of Boyce. Answer 23.

DISCUSSION

Rejection 1.

The Examiner rejected claims 2–5, 7–11, 14, 15, 17, 25, and 28 as obvious over Wilder in view of Alsup and further in view of Boyce.²

On review, Appellants assert reversible error on several bases. Appellants argue that one of skill in the art would not have combined the teachings of Wilder and Boyce, Appeal Br. 8–9, nor the teachings of Wilder and Boyce with Alsup, *id.* at 10. Appellants additionally argue that the cited art does not teach each element of the claims. Specifically, they assert that “none of the cited prior art teaches using two types of encapsulated particles,” *id.* at 12, and that “none of the cited prior art teaches using two different encapsulating matrix materials,” *id.*

² This rejection originally included claims 19, 20, and 26 but was subsequently amended. *See* Answer 2.

In support of their first argument, Appellants assert that one would not combine Boyce, which teaches to coat a hard particle with a matrix material so as to form a layer of hardfacing material, with Wilder, which teaches to form a resin-set abrading structure. *Id.* at 9. In response, the Examiner points out that there is no rejection based solely on these references and indicates that “[t]he combination of these references is within the context of Alsup and therefore the discussion of Wilder in view of Boyce . . . misapplies the intended combination.” Answer 18. The Examiner found Wilder taught drill bits having various types of abrasives. The Examiner found Wilder did not describe the rib feature which is taught by Alsup and Boyce was cited to teach the combination of mixed-abrasive and mixed-coating structure. Final Act. 8–10. Appellants’ argument does not establish reversible error in the rejection.

Appellants further argue that it would not have been obvious for one of skill in the art to employ the composition of Wilder and/or Boyce in forming the drill bit rib structure taught by Alsup. Appeal Br. 9–12. They assert that, while Alsup relates to “impreg bits” with two types of abrasive particles, it specifies that the different particles are placed so that they form different segments of the rib. *Id.* at 9–10. This permits one part of the rib to wear preferentially to form a channel for liquids to pass through. *Id.* Appellants offer the Declaration of Yuri Burhan in support of the view that one consulting the teachings of Alsup would likely adopt its full teachings such that the different abrasive particles would be separated into their own segments. *Id.* at 9–10; Burhan Decl. ¶ 8. The Declaration further indicates that one of skill in the art “would consider the teachings of Alsup more relevant than the teachings of Wilder and Boyce to forming an impreg bit, as

impreg bits are uniquely designed for abrading an earthen formation in downhole conditions.” Burhan Decl. ¶ 8.

The Examiner determined this reasoning inadequate and stated further that it “does not distinguish why Alsup's segmented abrasives would be preferred over Wilder or Boyce.” Answer 19. The Examiner also notes Burhan’s statement that “particularly, the ribs of an impreg bit are designed to perform the majority of the cutting action by preferentially wearing away supporting matrix material to expose diamond particles, or other ultrahard particles, which are impregnated within the supporting matrix material” and finds such statement generally descriptive of the compositions of Wilder and Boyce. *Id.* at 19–20; *see, e.g.*, Wilder, 1:20–23 (“The purpose of the secondary abrasive particles is to wear away preferentially thus exposing new abrasive faces of the primary abrasive particles.”)

“[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). Wilder teaches that it is broadly applicable to “abraders” which may include “oil well drill bits.” Wilder, 2:29–30. It further specifies that “[w]e prefer to employ, because of their physical properties . . . one of the following abrasive material, preferring among them diamonds, either natural or synthetic.” *Id.* at 2:41–45. This would seem to fall within the definition of “diamond impregnated” set forth in the Specification. Spec. 2–3. Thus, Wilder teaches a diamond impregnated drill bit, though not with a rib structure. At a minimum, Wilder teaches the use of encapsulated diamonds and a second encapsulated abrasive particle in an oil well drill bit. Alsup teaches the use of abrasives on a rib in a drill bit. Answer 18. Substituting the composition of Wilder

(having multiple encapsulated particles) for the segmented compositions of Alsup yields a predictable result. Accordingly, Appellants' arguments do not establish reversible error in the Examiner's rejection.

We have considered the Burhan Declaration, but do not find it persuasive of establishing patentability of the appealed subject matter. Although factual evidence is preferable to opinion testimony, such testimony is entitled to consideration and some weight so long as the opinion is not on the ultimate legal conclusion at issue. While an opinion as to a legal conclusion is not entitled to any weight, the underlying basis for the opinion may be persuasive. *In re Chilowsky*, 306 F.2d 908, 916 (CCPA 1962). Some weight ought to be given to a persuasively supported statement of one skilled in the art as to what was not obvious to him (*see In re Lindell*, 385 F.2d 453, 456 (CCPA 1967) and *In re Weber*, 341 F.2d 143 (CCPA 1965)). Here, Mr. Burhan has provided his opinion as to what a person of ordinary skill in the art would have understood based upon consideration of the present Specification and the prior art cited in the present record. (Declaration ¶¶ 4–9). Mr. Burhan, at paragraph 8 of his declaration, states, “[a]fter reading the cited references, I would not have thought it obvious to use at least two types of encapsulated hard particles to form the rib of an impreg bit.” However, Mr. Burhan does not direct us to evidence from the cited references or other documents to support this statement. Moreover, as established on the present record, Wilder teaches drill bits having two different abrasives and different encapsulation material. *See Wilder*, Example 5. Alsup is directed to diamond impregnated drill bits comprising diamond and/or other super-hard materials distributed within a supporting material; and Boyce discloses drill bits having coated particles or coated particles of superabrasive.

Appellants further argue that the cited prior art references do not teach or suggest all elements of the claims. They allege that “none of the cited prior art teaches using two types of encapsulated particles,” Appeal Br. 12, and that “none of the cited prior art teaches using two different encapsulating matrix materials,” *id.*

The Examiner finds that “Wilder in fact does teach use of two different abrasives and different encapsulation material.” Answer 17. Wilder’s specification provides support for such finding. Wilder 12:50–61. Further, Appellants seem to acknowledge “Wilder’s teachings that two types of particles can be coated with different metal coatings to equalize their densities.” Appeal Br. 13. Accordingly, Appellants’ argument does not establish reversible error in the Examiner’s finding that Wilder teaches the use of two different abrasives having different encapsulation materials.

Rejection 2.

The Examiner rejected claims 6, 12, 13, 16, 21, and 27 as obvious over Wilder in view of Alsup and further in view of Smith. Final Act. 14. Appellants incorporate their previous argument that one of skill in the art would not combine the teachings of Wilder and Alsup, *id.* at 15, and further contend that Smith does not teach or suggest the use of a third encapsulated abrasive, *id.* at 15–17. The first argument is not persuasive for the reasons articulated above.

In regard to their second argument, Appellants argue that Smith is inapposite as it teaches a “conglomerate of superabrasive particles.” Appeal Br. 15–17. That is, rather than a composition of abrasive particles, encapsulant, and a continuous phase, Smith teaches a cutting element formed by diamonds bound directly to other diamonds. Further, Appellants

assert that the different wear rates taught by Smith arise from different bonding strength in the direct diamond-to-diamond bonds rather than from the relative hardness of the abrasives of Wilder. *Id.* at 17.

It is known in the art to use diamond abrasives in drill bits, *see, e.g.*, Wilder, 2:41–45; Alsup, 1:16–17; and Viel ¶ 2, and to encapsulate multiple abrasives in different matrices, Wilder 12:50–61. Smith teaches the use of diamond feedstocks of two or more different strengths, Smith 7:35–39, as well as three or more size ranges, *id.* at 6:32–35. Smith further teaches exemplary ratios of diamonds of varying wear characteristics that include a ratio of 1:1. *Id.* at 6:59–63. Moreover, the Specification concedes that “one of ordinary skill in the art would appreciate the particular combination of encapsulated particle types and amounts may be varied depending on the particular application.” Spec. 16. Accordingly, taken as a whole, the teachings of the cited references tend to show that the use of multiple diamond feedstocks that vary in characteristics such as size and wear rate in the rib of a diamond impregnated drill bit would have been obvious to a person of ordinary skill in the art.

Rejection 3.

The Examiner rejected claims 18 and 29 as obvious over Wilder in view of Alsup and Mudholkar and further in view of Viel. Final Act. 16. Appellants seek review on two bases. First, they argue that one of skill in the art would not look to Mudholkar to determine the appropriate diamond

concentration in the rib of a drill bit.³ Appeal Br. 18–20. Second, Appellants argue that the cited prior art does not teach the claimed height to width ratio. *Id.* at 20–23.

The Examiner finds that Mudholkar teaches the claimed diamond concentration (“a minimum diamond concentration of 100”). Final Act. 17; *see also* Mudholkar, ¶ 32. Mudholkar provides that “[c]oncentration of coated diamond and fabrication of tools comprising coated superabrasive particles is conventional and well known in that art.” Mudholkar, ¶ 32. Mudholkar further provides that “[i]n one embodiment, the concentrations range from about 5 to 200.” *Id.* Appellants argue that one of skill in the art would know that Mudholkar does not relate to materials for downhole drilling and therefore not look to its teachings. Appeal Br. 19. In support, Appellants note Mudholkar’s use of a metal, metal alloy or resin binder, Mudholkar ¶ 29, rather than “a hard matrix material, such as tungsten carbide,” Appeal Br. 19. Appellants assert that the binder of Mudholkar “would not be able to withstand the downhole conditions encountered by the diamond impregnated drill bits taught in the present application.” *Id.* The Examiner, however, notes that Alsup, which the Appellants acknowledge to be relevant to downhole drilling, teaches a metallic binder phase of copper

³ In their Reply Brief, Appellants seek to put forth a new argument regarding whether the range disclosed by Mudholkar adequately teaches the claimed range. Under regulations governing appeals to the Board, a new argument not timely presented in the Appeal Brief will not be considered when filed in a Reply Brief, absent a showing of good cause explaining why the argument could not have been presented in the Appeal Brief. *See Ex parte Borden*, 93 USPQ2d 1473, 1477 (BPAI 2010) (informative) as well as 37 C.F.R. § 41.37 and § 41.41. Because the record contains no such showing, we will not consider the new argument in the Reply Brief.

or other non-ferrous alloys. Answer 25; *see also* Alsup, 2:19–22. Thus, the materials taught by Mudholkar are known to be used in downhole drilling. Moreover, the claims at issue are to a “drill bit,” without limitation as to use or suitability for downhole conditions. Accordingly, Appellants have not adequately explained why one of skill in the art would not look to the teachings of Mudholkar regarding diamond concentration.

Appellants also argue that Mudholkar differs from the present application in that it teaches to use the relevant concentration only on abrasive or grinding surfaces. Appeal Br. 18. This however, is consistent with the application before the Board which provides that “the encapsulated particles disclosed herein may have localized placement in a drill bit” and further that the particles may be confined to the leading side of a rib or blade. Spec. 21.

Accordingly, Appellants have not established reversible error in the Examiner’s determination that one of skill in the art would look to Mudholkar to determine an appropriate diamond concentration for a drill bit.

Appellants additionally argue that the cited prior art does not teach the claimed height to width ratio. Appeal Br. 20–23. Claims 18 and 29 require that “a portion of at least one rib has a height to width ratio of greater than about 1.75.”

The Examiner relies on Viel to supply the teaching of a rib with such a ratio: “Viel explains that the blades can be about 2mm wide and 4.8mm in length (para. 0071) and that they can be at the center of the drill bit (Fig. 12, 394 and 393).” Final Act. 18. Appellants assert that this teaching is inadequate as height, in the present claims, is distance from the body of the drill rather than length. Appeal Br. 21; *see also* Spec., Fig. 6B (rib height

shown as 640). Therefore, Appellants assert, there is no teaching of the requisite height to width ratio.

Appellants further rely upon the Declaration of Hems Mada. Mr. Mada testifies as follows:

As a person with considerable experience in designing impreg bits, I am aware that, generally, as a rib height increases and width decreases and with all other design parameters remaining the same, the rib may be more prone to breakage. I am also aware that, generally, increasing the concentration of diamond in a diamond impregnated bit rib may result in the rib having increased hardness, but decreased toughness, and thus may also be more prone to breakage. Thus, when designing an impreg bit rib, I consider the effects of increasing a height to width ratio of the rib in combination with the type of material used to form the rib.

Mada Declaration ¶ 8. Thus, the relationship between the height and width of the rib of a drill bit is known to be a result-effective variable.

“[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *Application of Aller*, 220 F.2d 454, 456 (C.C.P.A. 1955). It is apparent from the Mada Declaration that the relationship between rib height and width are known in the prior art. *See also*, *Alsup* 1:53–57 (discussing “raised ribs” on a drill bit). Accordingly, as in *Aller*, it is not inventive to discover the optimum relationship of the relevant variables (here, rib height and width).

Rejection 4.

The Examiner issued a new rejection for claims 19, 20 and 26 in the Answer. Answer 2–5, 23. These claims depend from claim 18, requiring, *inter alia*, a rib having a height to width ratio greater than 1.75. Claim 19

further requires a second type of encapsulated particle and a second matrix material. Claim 20 requires that the first and second matrix materials have different wear properties. Claim 26 depends from claim 19 and requires that the particles or matrix materials differ in one of several specified ways.

Appellants argue that the rejection is erroneous on several bases. First, they reiterate their argument that one of skill in the art would not combine the teachings of Wilder, Boyce and Alsup. Reply 4–8. Second, Appellants reiterate their argument that one of skill in the art would not look to the teaching of Mudholkar regarding diamond concentration. *Id.* at 8–9. Third, they reiterate their argument regarding the required height to width ratio. *Id.* at 9–11.⁴

These arguments are each addressed above and are found unpersuasive for the reasons set forth above.

CONCLUSION

The rejection of claims 2–21 and 25–29 is affirmed.

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

⁴ Appellants briefly assert that the number of references suggests that the Examiner engaged in hindsight reconstruction. Reply Br. 11. This contention, however, is insufficiently supported by argument or citation to evidence to present an issue for appeal. *See* 37 CFR 41.37(c)(iv).