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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JOEL MEIER HAYNES, NARENDRA DIGAMBER JOSHI,
DAVID JAMES WALKER, JUNWOO LIM,
SARAH MARIE MONAHAN, and KRISHNAKUMAR VENKATESAN

Appeal 2019-005775
Application 14/644,286
Technology Center 1700

Before JOSEPH L. DIXON, DONNA M. PRAISS, and
BRIAN D. RANGE, *Administrative Patent Judges*.

DIXON, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision to reject claims 1–6, 12, and 13. *See* Final Act. 1. Claim 7–11 and 14–20 are withdrawn from consideration. *See* Final Act. 2. We have jurisdiction under 35 U.S.C. § 6(b). We AFFIRM.

¹ We use the word Appellant to refer to “applicant” as defined in 37 C.F.R. § 1.42 (2018). Appellant identifies the real party in interest as General Electric Company. Appeal Br. 2.

CLAIMED SUBJECT MATTER

The claims are directed to a twin radial splitter-chevron mixer with converging throat. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A fuel nozzle for a gas turbine, comprising:

a first radial swirler and a second radial swirler that introduce radial swirl to a flow of pressurized air:

a chevron splitter between the two swirlers that directs the swirled flow of pressurized air to a main mixer passage to form a fuel-air mixture with fuel injected into the fuel nozzle; and

a main mixer passage that receives the fuel-air mixture from the chevron splitter, and includes a converging throat that accelerates the fuel-air mixture.

REFERENCES

The prior art relied upon by the Examiner is:

Mueller	US 2,511,291	June 13, 1950
Ansart et al	US 5,941,075	Aug. 24, 1999
Mongia et al.	US 6,367,262 B1	Apr. 9, 2002
Wirt et al.	US 8,017,084 B1	Sept. 13, 2011
Elkady et al.	US 8,099,960 B2	Jan. 24, 2012
Fernandes et al.	US 8,215,116 B2	July 10, 2012
Deng ²	CN 202082953 U	Dec. 21, 2011

² The Examiner also relied upon an English language translation of the abstract Derwent Acc-No. 2012-A79223 (Derwent Week: 201206) (filed by Appellant on Mar. 11, 2015).

REJECTIONS³

Claims 1–3 and 12 stand rejected under 35 U.S.C. § 103 as obvious over Mueller in view of Fernandes, Elkady, Mongia, Ansart, or Deng.

Claims 4–6 and 13 stand rejected under 35 U.S.C. § 103 as being unpatentable over Mueller in view of (Fernandes, Elkady, Mongia, Ansart, or Deng), and further in view of Wirt.

OPINION

35 U.S.C. § 103

Appellant has the burden on appeal to the Board to demonstrate error in the Examiner’s position. *See In re Kahn*, 441 F.3d 977, 985–86 (Fed. Cir. 2006). We review the appealed rejections for error based upon the issues identified by Appellant and in light of the arguments and evidence produced thereon. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential), (cited with approval in *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (“[I]t has long been the Board’s practice to require an applicant to identify the alleged error in the examiner’s rejections.”)). After considering the evidence presented in this Appeal and each of Appellant’s arguments, we are not persuaded that Appellant identifies reversible error. Thus, we affirm the Examiner’s rejections for the reasons expressed in the Final Office Action and the Answer. We add the following primarily for emphasis.

³ The Examiner has withdrawn the rejection of claims 1–3 and 12 under 35 U.S.C. § 102(a)(1) as anticipated by Mueller, and the obviousness rejection of claims 4–6 and 13 under 35 U.S.C. § 103 as being unpatentable over Mueller in view of Wirt. Ans. 7.

Claims 1–3 and 12

Appellant does not set forth separate arguments for patentability of claims 1–3 and 12. (*See* Appeal Br. 4; Reply Br. 2.) Based on Appellant’s arguments and our discretion under 37 C.F.R. § 41.37(c)(1)(iv), we select independent claim 1 as the representative claim for the group and address Appellant’s arguments thereto. *See* 37 C.F.R. § 41.37(c)(1)(iv). Dependent claims 2, 3, and 12 stand or fall with representative claim 1.

See 37 C.F.R. § 41.37(c)(1)(iv).

At the outset, we note that the background section of the present Specification discloses:

Conventional fuel-air mixers of premixed burners incorporate sets of inner and outer counter-rotating swirlers disposed generally adjacent an upstream end of a mixing duct for imparting swirl to an air stream. Different ways to inject fuel in such devices are known, including supplying a first fuel to the inner and/or outer annular swirlers, which may include hollow vanes with internal cavities in fluid communication with a fuel manifold in the shroud, and/or injecting a second fuel into the mixing duct via cross jet flows by a plurality of orifices in a center body wall in flow communication with a second fuel plenum.

Spec. ¶ 3. We find that this admitted prior art is remarkably similar to the five prior art references applied by the Examiner.

Appellant argues that “[i]t appears that a word search for the term ‘radial swirler’ was done and the first five references from the search list were simply cited.” Appeal Br. 4. Appellant further contends that “it is hard to conceive of a more ridiculously blatant example of hindsight.” Appeal Br. 5. Appellant contends that if the Mueller reference “already introduce[s] radial swirl (which they don’t for the reasons discussed), how would

utilizing any of the radial swirlers of the secondary references ‘further induce radial swirl in fluid introduced into’ Mueller’s mixer?’” Appeal Br. 5. Appellant further argues that the proposed combinations are “patently absurd.” Appeal Br. 5. Appellant also contends that the Examiner has not provided a reason with a rational underpinning for the combination. Appeal Br. 5; Reply Br. 2. Appellant contends that the Examiner merely states that the radial swirlers are somehow “utilized,” but provides no explanation of how or even where such radial swirlers could or would be utilized in Mueller. Reply Br. 2.

Appellant further argues that the “Examiner’s Answer does not explain how any of the relied upon radial swirlers would be incorporated with such tailpieces or valves.” Reply Br. 3. Appellant argues that the Examiner’s Answer provides no explanation for why one skilled in the art would modify a liquid mixer for a shower to somehow arrive at a fuel nozzle that introduces radial swirl to a flow of pressurized air.⁴ *Id.* Appellant also argues both swirlers are used with pressurized air, and Mueller, on the other hand, is directed to the flow of liquid instead of pressurized air. *Id.*

Although we agree with Appellant’s Reply Brief position that the Examiner did not expressly address the proffered difference in the fluids, we note that Appellant did not expressly argue this difference in the pressurized air and pressurized water in the Appeal Brief. Consequently, we find

⁴ We note that Appellant did not previously argue, in the Appeal Brief, the fact that the Mueller reference is directed to hot and cold water rather than to fuel-air mixing.

Appellant's argument to be waived.⁵ Arguments which Appellant could have made but did not make in the Briefs are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(iv).

We further note both air and pressurized water are fluids and similar known fluid dynamics principles would control both fluids.

Appellant argues that the Examiner's Answer, without explanation, merely asserts only that the radial swirlers mentioned in the five cited references vaguely can be "utilized" and that "[s]uch a utilization would have yielded predictable, advantageous results." Reply Br. 3.

We find Appellant's arguments to be general arguments for patentability where Appellant does not specifically address the merits of any of the specific teachings of any of the five secondary prior art references applied in the combination with the Mueller reference. Looking at the combination of the Mueller reference with each of the five separate

⁵ We note that the Reply Brief may respond to new arguments by the Examiner, but should not "substitute" for the principal brief. In the absence of a showing of good cause by Appellant, arguments that could have been made in the Appeal Brief and are not responsive to any new evidence or finding set forth by the Examiner in the Answer are deemed untimely and are waived. 37 C.F.R. § 41.41(b)(2); *see also Ex parte Nakashima*, 93 USPQ2d 1834, 1837 (BPAI 2010) (informative) (explaining that arguments and evidence not presented timely in the principal 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 principal brief); *Ex parte Borden*, 93 USPQ2d 1473, 1474 (BPAI 2010) (informative) ("[T]he reply brief [is not] an opportunity to make arguments that could have been made in the principal brief on appeal to rebut the Examiner's rejections, but were not.").

secondary prior art teachings, we find that the secondary references generally teach and suggest air-fuel mixing in combustion chambers with the use of radial swirlers for multiple air passageways (and may also teach an additional main swirler), a centralized chevron splitter between the two swirlers and air passageways, and a main mixer passage with converging throat.⁶

We note that the claimed invention is a “fuel nozzle” having only four structural elements (first radial swirler, second radial swirler, chevron splitter between the two swirlers, and main mixer passage (includes a converging throat)). With respect to Appellant’s questions regarding the exact placement of the radial swirlers at inlets 12 and 13 of the Mueller reference (Reply Br. 2–3), we find that the specific location of the swirlers is not set forth in the claimed invention because the radial swirlers are the first claimed elements and may be placed anywhere before the chevron splitter. Appellant further contends that there is no reasoning with rational underpinning provided by the Examiner and the reasoning provided is, in fact, completely irrational. Appeal Br. 5. We disagree with Appellant and find the Examiner provided a line of reasoning with a rational underpinning to provide additional turbulence which is expressly desired in the Mueller reference. Final Act. 8; Ans. 4–5 (“in order to further induce radial swirl in fluid introduced into their apparatus, for the purposes of maximizing mixing and turbulence, which is the desired endeavor of Mueller (maximizing

⁶ We further note that these five secondary references in the combination are similar to the admission in the background section of the Specification. Spec. ¶ 3.

mixing and turbulence, column 1, line 28). Such a utilization would not have yielded unexpected results.”).

In *KSR*, the Supreme Court emphasized “the need for caution in granting a patent based on the combination of elements found in the prior art,” and stated 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, 415–16 (2007). The Court explained:

When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, [section] 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

Id. at 417. The operative question is thus “whether the improvement is more than the predictable use of prior art elements according to their established functions.” *Id.*

Consistent with *KSR*, the Federal Circuit recognized that “[a]n obviousness determination is not the result of a rigid formula disassociated from the consideration of the facts of a case. Indeed, the common sense of those skilled in the art demonstrates why some combinations would have been obvious where others would not.” *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1161 (Fed. Cir. 2007) (citing *KSR*, 550 U.S. at 416). In *Leapfrog*, the Federal Circuit pointed to the lack of evidence that the proposed modification was “uniquely challenging or difficult for one of

ordinary skill in the art” or “represented an unobvious step over the prior art.” *Id.* at 1162.

Appellant has not provided persuasive argument regarding the Examiner’s proffered rationale for the combination. Appellant’s responsive argument merely questions “[i]f the inlet orifices 12, 13 of Mueller are already radial swirlers, how does utilizing ‘any of the radial swirlers of Fernandes, Elkady, Mongia, Ansart, and Deng for the inlets 12 and 13 of Mueller’ operate to ‘further induce radial swirl’?” Appeal Br. 5.

The Examiner’s statements that Appellant questions relate to the withdrawn anticipation rejection. Final Act. 6–7. The Examiner recognizes that Mueller’s orifices 12 and 13 do not include radial swirlers. Ans. 7. The Examiner’s reason for modifying Mueller by adding radial swirlers to each orifice to add additional swirl/turbulence therefore adequately supports the prior art combination based on the cited Appeal record. Ans. 8.

Appellant additionally argues that merely replacing the inlets of Mueller with radial swirlers would not change that Mueller uses two different liquids for its corresponding inlets in contrast to the presently claimed subject matter that recites pressurized air flow passing through both radial swirlers. Reply Br. 3. We disagree with Appellant’s argument and find that there are not “two different liquids,” but merely one type of liquid with different temperatures to achieve a uniform single temperature. (*See* Mueller column 2, lines 39–45.)

Consequently, Appellant's general arguments do not show error in the Examiner's factual findings or conclusion of obviousness of independent claim 1.⁷

Claims 4–6 and 13

Appellant argues that the Wirt reference does not remedy the deficiencies in the base combination because the Wirt reference is not analogous art “as it is neither from the claimed field of endeavor nor reasonably pertinent to the claimed subject matter.” Appeal Br. 6. Appellant also contends that the Examiner has provided no evidence in support of the factual finding that Wirt reference is analogous, i.e. from the claimed field of endeavor or reasonably pertinent to the problems faced by Appellant. Appeal Br. 6. Appellant additionally contends that the Examiner's Answer attempts to gloss over such profound differences by asserting that “Wirt is directed to generating turbulence to increase mixing efficiency and reduce the mixing distance” and is directed to the purported “particular problem” of the present application asserted as “mixing devices having a reduced length” and to the purported problem solved by Mueller “generating mixing and turbulence.” Reply Br. 4.

⁷ Alternatively, looking at the totality of the prior art teachings, the secondary references may be viewed as the primary reference because the secondary references clearly teach at least a single swirler, a chevron splitter in the center of the nozzle, and a converging throat in the main mixer passage, but include only a large swirler for which multiple swirlers may have been obvious in the presence of multiple air inlets. We leave it to the Examiner to further evaluate this in any further prosecution on the merits along with to the admitted prior art in paragraph 3 of the Specification.

The Examiner finds that it would have been obvious to one having ordinary skill in the art at the time the invention was filed to utilize the corrugations of Wirt's chevron-shaped member on Mueller's chevron splitter (or, alternatively, Mueller in view of Fernandes, Elkady, Mongia, Ansart, or Deng), in order to generate turbulence to increase mixing efficiency and reduce the mixing distance, as disclosed in Wirt (column 6, lines 62–67) because the generation of turbulence for mixing purposes is further disclosed as a desired feature of Mueller's chevron splitter (column 1, lines 27–28). Final Act. 9; Ans. 6.

We agree with the Examiner that the Mueller reference discloses and suggests a desire to produce a maximum amount of mixing and turbulence between more than one stream of fluid (Mueller column 1, line 28) and the Wirt reference further discloses and suggests the well-known use of corrugations for turbulence enhancement in mixing fluids/gases for even distribution where the corrugated turbulence enhancer “dramatically increases mixing efficiency and reduces the mixing distance” (Wirt column 6, lines 50–67). We agree with the Examiner that skilled artisans would have been motivated to dramatically increase mixing efficiency and reduce mixing distance in mixing apparatuses.

Appellant argues that there are “profound differences” and the rejection lacks evidence in support of the factual finding that Wirt is analogous prior art, i.e. from the claimed field of endeavor or reasonably pertinent to the problems faced by Appellant. Reply Br. 4. We disagree with Appellant and find that the Wirt reference is reasonably pertinent to the problem of turbulent mixing of two separate fluids/gases as the Examiner found. Ans. 8 (“Wirt is additionally pertinent to the problem solved of

Mueller (generating mixing and turbulence, column 1, line 28).”); Final Act. 4–5, 9. Accordingly, based on this Appeal record, Wirt is reasonably pertinent to the problems faced by Appellant.

As a result, we find Appellant’s general arguments to be unavailing with respect to the Examiner’s factual findings or ultimate conclusion of obviousness of dependent claim 4 and dependent claims 5, 6, and 13 not separately argued.

CONCLUSION

The Examiner’s obviousness rejections are affirmed.

DECISION SUMMARY

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–3, 12	103	Mueller, Fernandes, Elkady, Mongia, Ansart, and Deng	1–3, 12	
4–6, 13	103	Mueller, Fernandes, Elkady, Mongia, Ansart, and Deng, Wirt	4–6, 13	
Overall Outcome			1–6, 12, 13	

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