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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/940,075	11/05/2010	Steven J. Bullied	0012840U; 67097-1376PUS1	6715

54549 7590 09/23/2016

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EXAMINER	
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ART UNIT	PAPER NUMBER
1735	

NOTIFICATION DATE	DELIVERY MODE
09/23/2016	ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte STEVEN J. BULLIED, CARL R. VERNER, and GAURAV M. PATEL

Appeal 2015-005799
Application 12/940,075
Technology Center 1700

Before BRADLEY R. GARRIS, ELIZABETH M. ROESEL, and MICHAEL G. MCMANUS, *Administrative Patent Judges*.

ROESEL, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants[1] appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 6–8, 10, 11, and 18–25. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] United Technologies Corporation is identified as the real party in interest. App. Br. 1.

STATEMENT OF THE CASE

Claimed Invention

Appellants claim a die casting system. Independent claims 6, 18, and 23 are representative of the subject matter on appeal and are reproduced below from Appellants' Claims Appendix, with bold added to identify the limitations that are the focus of Appellants' arguments:

> 6. A die casting system, comprising:
>
> a die comprised of a plurality of die components that define a die cavity;
>
> a shot tube in fluid communication with said die cavity, wherein said shot tube includes an integrated melting unit configured to heat a charge of material from a position inside of said shot tube, **said shot tube including a first sleeve of a first material and a second sleeve of a second, different material;**
>
> a shot tube plunger moveable within said shot tube to communicate said charge of material into said die cavity; and
>
> **wherein each of said die, said shot tube, said integrated melting unit and said shot tube plunger are positioned within a vacuum chamber.**
>
> 18. A die casting system, comprising:
>
> a die that defines a die cavity;
>
> a shot tube in fluid communication with said die cavity, wherein said shot tube includes an integrated melting unit configured to heat a charge of material from a position inside of said shot tube **without preheating said charge of material from a position outside of said shot tube**, said shot tube including a first sleeve of a first material and a second sleeve of a second, different material; and
>
> a shot tube plunger moveable within said shot tube to communicate said charge of material into said die cavity.
>
> 23. A die casting system, comprising:

a die that defines a die cavity;

a shot tube in fluid communication with said die cavity, said shot tube including a first sleeve that extends inside of said die and a second sleeve that is disposed outside of said die, wherein said first sleeve is a graphite sleeve and said second sleeve is a ceramic sleeve;

a gate that connects said shot tube to said die cavity;

an integrated melting unit that includes an induction coil positioned around said second sleeve and configured to heat a charge of material from a position inside of said second sleeve;

a power source that powers said induction coil;

a cooled copper shot tube plunger moveable within said shot tube to communicate said charge of material into said die cavity; and

a vacuum chamber that includes a vacuum source that applies a vacuum within said vacuum chamber, wherein said die, said shot tube, said integrated melting unit and said cooled copper shot tube plunger are disposed within said vacuum chamber.

App. Br. 11–13.

References

Fujino et al.	US 4,842,038	June 27, 1989 ("Fujino")
Mueller	US 5,048,592	Sept. 17, 1991
Linden, Jr. et al.	US 5,195,572	Mar. 23, 1993 ("Linden")
Taniguchi et al.	US 6,189,600 B1	Feb. 20, 2001 ("Taniguchi")
Perrella et al.	US 6,354,359 B2	Mar. 12, 2002 ("Perrella")
Muramatsu et al.	US 2007/0215306 A1	Sept. 20, 2007 ("Muramatsu")

Rejections

1. Claims 6, 7, 11, and 22 are rejected under 35 U.S.C. § 103(a) as unpatentable over Fujino, Taniguchi, and Linden. Final Action 3–5.[2]

2. Claim 8 is rejected under 35 U.S.C. § 103(a) as unpatentable over Fujino, Taniguchi, Linden, and Muramatsu. *Id.* at 5–6.

3. Claim 10 is rejected under 35 U.S.C. § 103(a) as unpatentable over Fujino, Taniguchi, Linden, and Perrella. *Id.* at 6–7.

4. Claims 18 and 21 are rejected under 35 U.S.C. § 103(a) as unpatentable over Fujino and Linden. *Id.* at 7–8.

5. Claim 19 is rejected under 35 U.S.C. § 103(a) as unpatentable over Fujino, Linden, and Taniguchi. *Id.* at 9.

6. Claim 20 is rejected under 35 U.S.C. § 103(a) as unpatentable over Fujino, Linden, and Mueller. *Id.* at 9–10.

7. Claims 23–25 are rejected under 35 U.S.C. § 103(a) as unpatentable over Fujino, Taniguchi, Linden, Muramatsu, and Perrella. *Id.* at 10–14.

ANALYSIS

Appellants' arguments are directed to independent claims 6, 18, and 23 and dependent claim 8 only. Appellants present no separate argument regarding the other claims. *See* App. Br. 3–9. As a consequence, the remaining dependent claims stand or fall together with their parent independent claims, and we confine our discussion to claims 6, 8, 18, and 23.

[2] Final Action mailed June 19, 2014.

Claim 6

The Examiner finds that Fujino discloses a die casting system embodying all limitations of claim 6, except "said shot tube including a first sleeve of a first material and a second sleeve of a second, different material" and "wherein each of said die, said shot tube, said integrated melting unit and said shot tube plunger are positioned within a vacuum chamber." Final Action 3–4. The Examiner finds that these limitations are taught by Linden and Taniguchi, respectively, and provides a reason for modifying the die casting system of Fujino to include each of these features. *Id.* at 4–5.

Appellants argue that the Examiner's proposed modification of Fujino in view of Taniguchi would render Fujino's apparatus unsatisfactory for its intended purpose and offer no benefit. App. Br. 4–6. Appellants additionally argue that the proposed modification of Fujino in view of Linden would cause "significant problems" that would lead a person of ordinary skill in the art away from the proposed modification. *Id.* at 6–7.

For the reasons set forth in the Final Action, the Answer, and below, we are not persuaded that Appellants identify reversible error in the Examiner's rejection of claim 6.

Appellants argue that one of the main objectives of Fujino is simultaneous melting and injection, which would not be possible if the die were under vacuum because the vacuum chamber would have to be broken to remove each casting from the die. App. Br. 4; Reply Br. 2. Appellants' argument is unsupported by evidence and does not persuasively refute the Examiner's finding that a person of ordinary skill in the art would have positioned the entire die casting apparatus in a vacuum chamber in order to prevent formation of an oxide film on the molten metal. Final Action 4;

Ans. 3. The Examiner's finding is supported by Fujino, which recognizes that formation of oxides on molten metal surfaces degrades productivity and product quality. Fujino, 1:45–53. The Examiner's finding is further supported by Taniguchi, which discloses that, for the purpose of preventing the molten metal from forming an oxide film, the entire die casting apparatus, including the casting mold, is maintained in a vacuum. Taniguchi 8:25–30.

Appellants do not direct us to evidence in Fujino, Taniguchi, or elsewhere in the record to support their argument that the vacuum chamber would have to be broken to remove each casting from the die. App. Br. 4; Reply Br. 2. Taniguchi discloses removing a cast article from a casting mold disposed in a vacuum chamber, Taniguchi, 8:25–30, 9:20–23, but does not mention breaking the vacuum during this removal step. While attorney arguments are helpful when directing us to evidence in the record, the arguments themselves do not constitute evidence. *In re Geisler*, 116 F.3d 1465, 1471 (Fed. Cir. 1997) (attorney argument cannot take the place of evidence).

We are also not persuaded that simultaneous melting and injection is a "main objective" of Fujino, as argued by Appellants. App. Br. 4; Reply Br. 2. Appellants explain that Fujino achieves this objective with a staged injection cycle that utilizes two injection sleeves. App. Br. 4 (citing Fujino 4:3–12). As correctly noted by the Examiner, however, Fujino also discloses embodiments utilizing a single injection sleeve. Ans. 4; Fujino 4:30–33, 6:13–34, Fig. 5. As discussed above, Appellants fail to provide evidence sufficient to support their assertion that simultaneous melting and injection could not be achieved by placing the entire die casting apparatus in

a vacuum chamber. Even if we accepted this assertion, however, we are not persuaded that the proposed modification runs counter to Fujino, which discloses embodiments that have a single injection sleeve enabling sequential, but not simultaneous, melting and injection. Fujino 4:30–33, 6:13–34, Fig. 5.

Appellants argue that "the preheating, melting and injection sections of *Fujino* are already placed in a vacuum generating chamber" and "[t]herefore, there is no risk of the molten metal of *Fujino* forming an oxide film and the proposed modification offers no benefit." App. Br. 6. We disagree. The Examiner finds that positioning the entire die casting apparatus in a vacuum chamber provides a benefit, namely preventing formation of an oxide film on the molten metal. Final Action 4; Ans. 3. The Examiner's finding is supported by Taniguchi, which discloses this benefit. Taniguchi, 8:25–30. Although Fujino discloses that thermal efficiency can be improved by placing sections of the die casting apparatus in a vacuum, Fujino 4:16–21, Taniguchi teaches that placing the entire apparatus, including the casting mold (die), in a vacuum provides an additional benefit. Taniguchi, 8:25–30 (vacuum prevents formation of oxide film on molten metal); *see also* Fujino, 1:45–53 (oxide films "degrade the productivity and quality of the products").

We are not persuaded by Appellants' argument that modification of Fujino in view of Linden would lead one of ordinary skill in the art away from the Examiner's proposed modification. App. Br. 6; Reply Br. 2–3. Appellants rely on Linden's disclosure that "high pressure stresses . . . have caused significant problems when ceramics have been employed in die casting machines in the past." Linden, 6:18–20. Despite these problems,

Linden discloses embodiments in which the injection sleeve is composed, in whole or in part, of ceramic material. *Id.* at 6:11–26. Linden teaches advantages of such injection sleeves, including prolonged life, material cost savings, and reduced manufacturing cost. *Id.* at 6:2–13. Linden states that a pour hole in the injection sleeve avoids high pressure stresses that have caused problems in the past, *id.* at 6:13–20, but does not indicate that a pour hole is the only way to avoid high pressure stresses. We are not persuaded that a person of ordinary skill in the art would be unable to design a ceramic injection sleeve without a pour hole that avoids the problems noted in Linden.

A preponderance of the evidence demonstrates that Appellants' claim 6 is directed to a die casting system comprising known components, including a vacuum chamber and a shot tube having first and second sleeves made of different materials, where each of these components performs its established function, and the combination yields no more than one would expect from such an arrangement. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Based on the foregoing, the weight of the evidence supports the Examiner's conclusion of obviousness. Therefore, the § 103(a) rejection of claim 6 is sustained.

Claim 8

Claim 8 depends from claim 6 and recites: "wherein said first sleeve is a graphite sleeve and said second sleeve is a ceramic sleeve." App. Br. 11.

The Examiner finds that Muramatsu teaches a die casting system including a graphite sleeve. Final Action 6 (citing Muramatsu ¶ 35). The

Examiner concludes that it would have been obvious to combine Muramatsu's graphite sleeve with Linden's ceramic sleeve to obtain the advantages disclosed in each reference. *Id.*

Appellants argue that Muramatsu's disclosed benefits can be achieved only by using a single graphite sleeve and only if the plunger tip is also made of graphite. App. Br. 8.

For the reasons set forth in the Final Action, the Answer, and below, we are not persuaded that Appellants identify reversible error in the Examiner's rejection of claim 8.

Appellants' argument is unsupported by evidence and does not persuasively refute the Examiner's conclusion that a person of ordinary skill in the art would have combined Muramatsu's graphite sleeve with Linden's ceramic sleeve to obtain the disclosed advantages of each material. Final Action 6; Ans. 6–7.

The Examiner's conclusion is supported by Linden, which discloses a two-piece shot sleeve composed of two sections, both of which are composed of high temperature resistant material. Linden 3:56–4:4. In one embodiment, one sleeve section is composed of steel and another sleeve section is composed, in whole or in part, of ceramic. *Id.* at 4:1–4, 6:2–26. According to Linden, ceramic prolongs the life of the sleeve. *Id.* at 6:11–13. The Examiner's conclusion is also supported by Muramatsu, which discloses a die casting machine including a sleeve, which is preferably composed of graphite. Muramatsu ¶¶ 3, 15, 28, 33. Muramatsu discloses a number of reasons to select graphite as the material for the sleeve, including thermal conductivity, non-reactivity with molten metal, laminar flow of the metal, and slidable property of graphite. Muramatsu ¶ 35.

We are not persuaded by Appellants' contention that Muramatsu's disclosed benefits can only be achieved when graphite is used to make a one-piece sleeve. Muramatsu's disclosed reasons for selecting graphite relate to properties of the material, not the particular configuration of the sleeve as one-piece or two-piece. Muramatsu ¶ 35 (discussing thermal conductivity, non-reactivity, laminar flow, and slidable property of graphite sleeve). Appellants do not direct us to evidence or technical reasoning sufficient to persuade us that the Examiner errs in relying on the properties of graphite, as disclosed in Muramatsu, as providing reasons for selecting the same material for use in a two-piece sleeve, as taught by Linden.

To the extent that Appellants argue that Muramatsu's benefits can only be obtained when graphite is used both for the sleeve and the plunger tip, that argument does not support patentability of Appellants' claim 8, which does not specify the material for the plunger tip.

Based on the foregoing, the weight of the evidence supports the Examiner's conclusion of obviousness. Therefore, the § 103(a) rejection of claim 8 is sustained.

Claim 18

Appellants refer back to their arguments in support of claim 6 regarding modification of Fujino to include the two-piece shot tube of Linden. App. Br. 8. For the reasons discussed above, these arguments are not persuasive of reversible error.

Appellants additionally argue that the Examiner errs in rejecting claim 18 over Fujino and Linden because the Fujino system includes a preheater and is not capable of melting without preheating the charge material. App. Br. 8–9.

For the reasons set forth in the Final Action, the Answer, and below, we are not persuaded that Appellants identify reversible error in the Examiner's rejection of claim 18.

Claim 18 recites: "an integrated melting unit configured to heat a charge of material from a position inside of said shot tube without preheating said charge of material from a position outside of said shot tube." App. Br. 12. Appellants do not dispute the Examiner's finding that Fujino discloses an integrated melting unit in the form of heaters 31 shown in Fujino Figure 1. Final Action 7 (citing Fujino 3:20–30). Appellants also do not dispute the Examiner's finding that Fujino's heaters 31 are configured to heat a charge of material from a position inside of said shot tube. *Id.* (citing 3:40–50). According to Fujino, heaters 31 may be induction heaters mounted on the outer surface of the injection sleeve—the same type of structure as disclosed in Appellants' Specification for performing the recited function. *Compare* Fujino 3:22–24, *with* Spec. ¶ 31 ("the integrated melting unit 225 includes an induction coil 227 mounted about the shot tube 224").

The Examiner is correct that claim 18's recitation, "without preheating said charge of material from a position outside of said shot tube," is a functional limitation. Final Action 7; Ans. 8. The Examiner's finding that Fujino discloses structure (heaters 31) equivalent to Appellants' disclosed structure is sufficient to shift the burden to Appellants to show that Fujino's structure is not capable of performing the recited function. *In re Schreiber*, 128 F.3d 1473, 1478 (Fed. Cir. 1997). Appellants do not provide evidence or technical reasoning sufficient to persuade us that Fujino's disclosed heaters 31 are not capable of heating a charge of material without preheating. The opposite finding is supported by Fujino, which discloses an

embodiment including induction heaters, where a preheater is optional. Fujino, 4:54–56, 5:64–68 (Fig. 3 embodiment includes heaters 35 and 36, e.g., induction heaters, where billet is supplied directly to injection sleeve without preheating).

Based on the foregoing, the weight of the evidence supports the Examiner's conclusion of obviousness. Therefore, the § 103(a) rejection of claim 18 is sustained.

Claim 23

Appellants refer back to their arguments in support of claims 6 and 8 regarding the Examiner's proposed modifications of Fujino in view of Taniguchi, Linden, and Muramatsu. App. Br. 9. For the reasons discussed above, these arguments are not persuasive of reversible error.

Appellants argue that claim 23 is not obvious for the additional reason that it recites a cooled copper shot tube plunger that would not achieve any of the benefits detailed by Muramatsu when used with a graphite shaft. *Id.*

For the reasons set forth in the Final Action, the Answer, and below, we are not persuaded that Appellants identify reversible error in the Examiner's rejection of claim 23.

Appellants' argument is unsupported by evidence or technical reasoning sufficient to identify error in the Examiner's rejection. We are not persuaded that at least some of the benefits of graphite identified by Muramatsu—thermal conductivity, non-reactivity, laminar flow, and slidable property—could not be obtained when combining a graphite injection sleeve with a cooled copper shot tube plunger. Ans. 9–10.

Based on the foregoing, the weight of the evidence supports the Examiner's conclusion of obviousness. Therefore, the § 103(a) rejection of claim 23 is sustained.

CONCLUSION OF LAW AND DECISION

The decision of the Examiner 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) (1).

AFFIRMED