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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BRIAN D. PRZESLAWSKI
and RAJEEV V. NAIK

Appeal 2011-012159
Application 11/787,431
Technology Center 1700

Before CHUNG K. PAK, ROMULO H. DELMENDO, and GEORGE C. BEST, *Administrative Patent Judges*.

DELMENDO, *Administrative Patent Judge*

DECISION ON APPEAL

The named inventors (hereinafter "the Appellants")[1] seek our review under 35 U.S.C. § 134(a) of various rejections entered against claims 1-10, 13, 15, 16, 18-23, 34-36, 39, 40, 43-45, 47-52, 57, 58, 63-69. We have jurisdiction under 35 U.S.C. § 6(b). We affirm-in-part and reverse-in-part.

[1] The Appellants identify the real party in interest as "Howmet Corporation." Appeal Brief filed March 14, 2011 ("App. Br.") at 2.

STATEMENT OF THE CASE

The subject matter of Appellants' claims relates to casting of molten metal or alloy. Specification ("Spec.") 1. Representative claim 69 is reproduced below:

> 69. Mold assembly for casting molten metal or alloy melt, comprising a melt-containing mold cup, a melt supply passage in melt flow communication to the mold cup, and a plurality of molds that are connected in melt flow communication to the melt supply passage in series arrangement one after another wherein adjacent molds of the series are connected in melt flow communication by a respective melt supply passage extending from a top region of a preceding mold to a bottom region of a next succeeding mold to provide top-to-bottom molten metal flow relation between adjacent molds, and wherein the respective melt supply passage is configured a manner that each of the molds of the series is at least partially filled before the next mold in the series is at least partially filled.

App. Br. 42 (Claims App'x).

The Examiner rejected the claims as follows:

I. Claims 68[2] and 69 under 35 U.S.C. § 102(b) as anticipated by Alleweireldt;[3]

II. Claims 1-8, 13, 15, 16, 18, 22, 23, 34, 39, 40, 44, 45, 47, 50, and 51 under 35 U.S.C. § 103(a) as unpatentable over Hoult[4] and Anderson;[5]

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[2] At page 4 of the Final Office Action entered May 14, 2010, the Examiner indicated that claim 68 was allowable. At page 7 of the Examiner's Answer entered May 9, 2011 ("Ans."), the claim was newly rejected. In response to the new ground of rejection, the Appellants requested that the appeal be maintained. Reply Brief filed July 8, 2011 at 1.

[3] U.S. Patent 5,899,257 issued May 4, 1999.

[4] U.S. Patent 4,072,180 issued February 7, 1978.

III. Claims 1, 9, 10, 34-36, and 43 under 35 U.S.C. § 103(a) as unpatentable over Hagemeyer[6] and Anderson; and

IV. Claims 19-21, 48, 49, 52, 57, 58, and 63-67 under 35 U.S.C. § 103(a) as unpatentable over Hoult, Anderson, and Alleweireldt.

Ans. 3-12.

DISCUSSION

I.

We start with Rejection I.

The Examiner found that Alleweireldt describes every limitation of claims 68 and 69. Ans. 3-4, 7. According to the Examiner, "the melt supply passage [disclosed in Alleweireldt] provides top-to-bottom molten metal flow relation between adjacent molds[,]" as required in claims 68 and 69. *Id*. at 3, 7.

The Appellants dispute the Examiner's finding regarding the molten metal supply flow relation of adjacent molds. App. Br. 16; Reply Br. 8.

Thus, the dispositive issue is:

Did the Appellants show reversible error in the Examiner's finding that Alleweireldt describes the limitation "the molten metal or alloy being supplied to the bottom of each mold in the series by a melt supply passage extending from the top of the preceding mold in the series," as recited in claim 68, or "adjacent molds of the series are connected in melt flow communication by a respective melt supply passage extending from a top region of a preceding mold to a bottom region of a next succeeding mold to

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[5] U.S. Patent 4,981,167 issued January 1, 1991.
[6] U.S. Patent 2,247,777 issued July 1, 1941.

provide top-to-bottom molten flow relation between adjacent molds," as recited in claim 69?

We agree with the Appellants on this issue. While claims under examination are given their broadest reasonable construction, "such construction [must] be '*consistent with the specification*, . . . and . . . claim language should be read in light of the specification *as it would be interpreted by one of ordinary skill in the art*.'" *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1260 (Fed. Cir. 2010) (quoting *In re Bond*, 910 F.2d 831, 833 (Fed. Cir. 1990)).

The current Specification informs one skilled in the relevant art as follows:

> The present invention provides method and mold assembly for casting molten metal or alloy (melt) that involve providing a metal or alloy melt in a melt-receiving mold cup of a mold assembly and *supplying the melt from the mold cup to a melt supply passage* of the mold assembly for flow to a plurality of molds that are connected in melt flow communication to the melt supply passage in series arrangement one after another. The melt supply passage is configured in a manner that each of the molds of the series is at least partially filled before the next mold in the series is at least partially filled.

Spec. 3 (emphasis added).

Furthermore, Figure 6 of the subject application, reproduced below, shows:

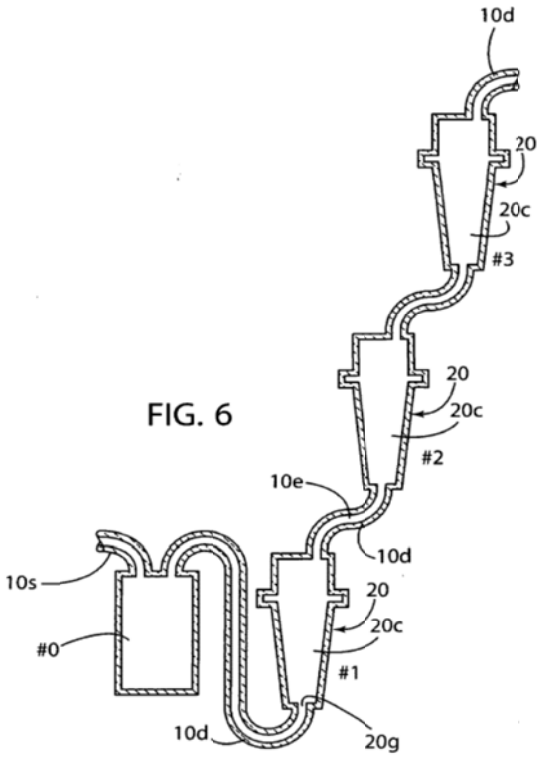
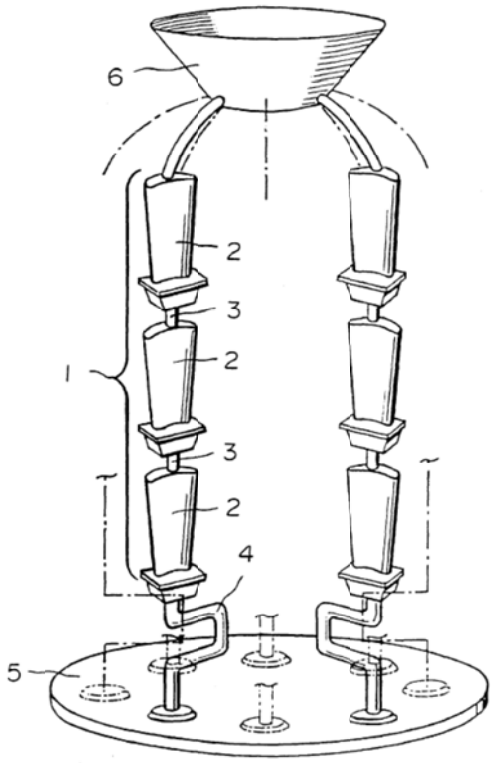


FIG. 6

Specifically, Figure 6 depicts a mold assembly having a first faux or false non-article forming mold #0 supplied with melt entering from a mold cup (not shown) via gating spoke 10s in a dead-end flow manner and subsequent article-forming molds #1 – #3 connected by sequential melt supply members 10d in top-to-bottom manner to provide flow of molten metal or alloy from the top of each mold to the bottom of the next mold. Spec. 18-19.

One skilled in the relevant art would have understood from these disclosures that the direction of "melt flow communication" recited in claims 68 and 69 is *relative to the mold cup as the point of origin* for the metal or alloy "supply." The Examiner has not directed us to any description in the Specification that compels a different construction.

Having construed the key disputed claim limitations, we consider the teachings of Alleweireldt. Figure 1 of Alleweireldt is reproduced below:



Alleweireldt's Figure 1 above depicts an apparatus for casting turbine blades according to the lost wax molding process, wherein molten metal is poured from sprue cup 6 into three blades 2 superposed end-to-end in strings 1 via passage 3. Col. 2, ll. 12-36. In contrast to the subject matter of claim 68 or 69, the molten metal is supplied from the sprue cup 6 into each of the blades 2 through passage 3 in a bottom-to-top melt flow communication relationship.

Therefore, we cannot agree with the Examiner that Alleweireldt anticipates claims 68 and 69.

II.

We next consider Rejection II. The Appellants argue various groups of claims under separate headings. App. Br. 17-25. To the extent the

arguments under these separate headings comply with 37 C.F.R. § 41.37(c)(1)(viii), we consider them separately below. Otherwise, all claims stand or fall with claim 1, which we reproduce below:

> 1. Method for casting molten metal or alloy, comprising providing a metal or alloy melt in a melt-containing mold cup of a mold assembly and supplying the melt from the mold cup to a melt supply passage of the mold assembly for flow to a plurality of spaced apart ceramic shell molds that are connected in melt flow communication to the melt supply passage in series arrangement disposed laterally one after another, wherein the melt supply passage forms an unobstructed melt flow path directly to respective mold ingates in a manner that each of the molds of the series is at least partially filled before the next mold in the series is at least partially filled.

Id. at 34.

Claim 1:

The Examiner found that "Hoult substantially shows the invention as claimed except that [Hoult's] molds are conventional sand molds rather than ceramic casting molds[,]" as required by claim 1. Ans. 4. Relying on Anderson, however, the Examiner concluded that the "use [of] ceramic casting molds in lieu of sand molds for casting a plurality of cast articles in the process of Hoult [would have been] deemed [by one of ordinary skill in the art] to be nothing more than an obvious matter of design choice[.]" *Id.*

The Appellants contend that weirs 5 and wells 6 in Hoult constitute obstructions in the flow path and therefore Hoult does not describe "an unobstructed melt flow path," as recited in claim 1. App. Br. 17-18. The Appellants also argue that a person of ordinary skill in the art would not have combined Hoult and Anderson "given the disparate molds types and mold features." *Id*. at 18.

Thus, the dispositive issues arising from these contentions are:

Did the Appellants show reversible error in the Examiner's finding that Hoult describes "an unobstructed melt flow path," as required by claim 1?

Did the Appellants show reversible error in the Examiner's conclusion that a person of ordinary skill in the art would have combined Hoult and Anderson?

We do not find the Appellants' argument persuasive to show reversible error. *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011).

As stated above, the PTO is obligated to give claims during examination their broadest reasonable interpretation consistent with the written description. In this case, the Appellants do not direct us to any portion of the Specification that contains a special definition for the term "unobstructed." The Appellants acknowledge, however, that claim 1 encompasses the embodiment shown in Figure 4A of the subject application. App. Br. 6. Thus, it is appropriate for us to consider Figure 4A in ascertaining the scope of the term "unobstructed."

Figure 4A of the application is reproduced below:

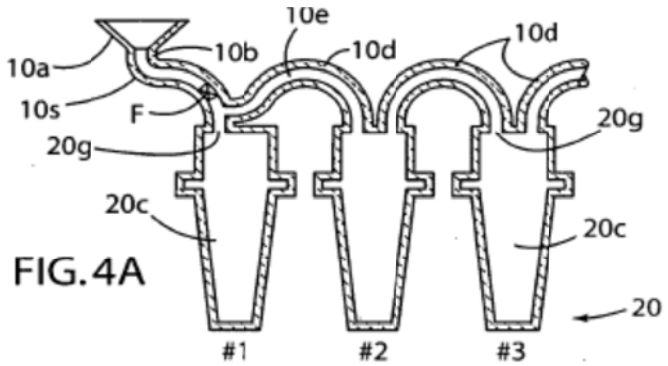


FIG. 4A

Figure 4A above shows molds 20 connected by arc-shaped sequential melt supply members 10d having passages 10e. Spec. 18. As pointed out by the Examiner at page 8 of the Answer, the "melt supply passage" that forms the

"unobstructed melt flow path," as those terms are used in claim 1, includes stepped passage portions that restrict flow into the arc-shaped supply members 10d, especially mold #1. Therefore, we conclude that one skilled in the relevant art would reasonably construe the limitation "unobstructed melt flow path" to read on flow paths that may include protrusions, steps, or restrictions including passage segments with smaller openings, provided that the flow is not otherwise obstructed (i.e., blocked).

Under the correct claim construction, Hoult describes the disputed claim limitation. Hoult's Figure 1 is reproduced below:

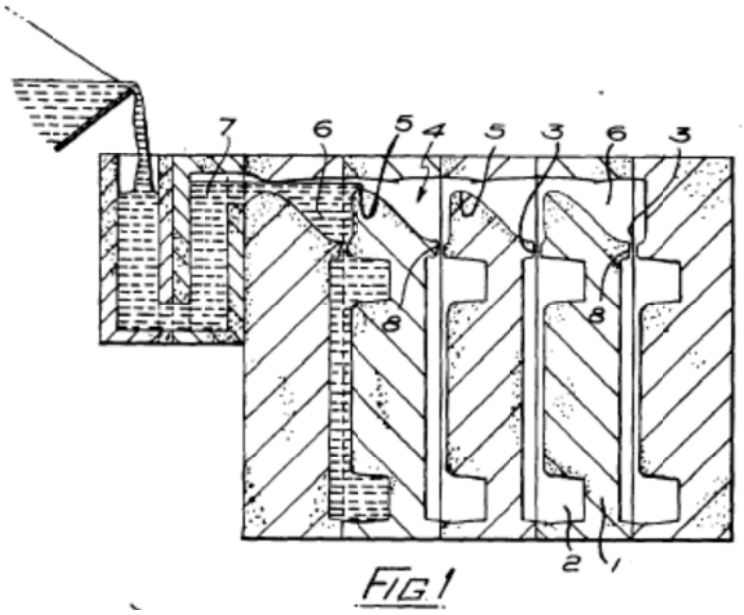


FIG 1

Hoult's Figure 1 shows a mold for casting molten metal, wherein the molten metal is poured into inlet 7 such that molten metal flows into well 6, into mold cavity 2, and then over weir 5 through runner feeder 4 into the next mold cavity in series. Col. 4, ll. 29-52. Hoult explicitly teaches that "the minimum cross-sectional area of the runner-feeder (above the weir) [is] not less than the cross-sectional area of the ingate 3 to each cavity." Col. 4, ll. 37-43.

While the Appellants are correct that Hoult's apparatus includes weirs 5 and wells 6, they do not constitute obstructions relative to the openings defined by ingates 3. Therefore, we agree with the Examiner's finding that "the supply passage in . . . Hoult is considered to be an unobstructed melt flow path directly to respective mold ingates as it does not prevent the molten metal from moving through the supply passage." Ans. 9.

We disagree with the Appellants that a person of ordinary skill in the art would not have combined Hoult and Anderson. Indeed, the Appellants acknowledge that Anderson teaches ceramic molds on a sprue loop. App. Br. 18. Thus, we find the Examiner's reason for combining the references to be supported by the evidence and reasonable. Although Anderson's system is not identical to that disclosed in Hoult, that fact alone does not preclude a person of ordinary skill in the art from considering their collective teachings.

Accordingly, we affirm the Examiner's rejection of claim 1.

Claim 8:

Claim 8 indirectly depends on claim 1 through intervening claim 3 and recites the further limitation "wherein subsequent molds being filled with the molten metal or alloy have lower levels of foreign matter than the molten metal or alloy filling the first mold." App. Br. 35.

The Examiner reasoned that "if the sequential filling of molten metal into the mold cavity in the instant process results in lower levels of foreign matter in the mold subsequent to the first mold so does the process of . . . Hoult . . . since the process of . . . Hoult . . . also sequentially fills the mold cavities." Ans. 9-10.

The Appellants argue that the references "fail to disclose or suggest" the claim limitation. App. Br. 18. That, however, is not an argument in

support of separate patentability pursuant to 37 C.F.R. § 51.37(c)(1)(vii). *In re Lovin*, 652 F.3d 1349, 1356-57 (Fed. Cir. 2011).

Claim 13:

Claim 13 recites "an arc-shaped passage communicated directly to respective ingates of respective adjacent molds." App. Br. 36.

The Examiner found that "the differen[ce] in shape presents no novel or unexpected results and solves no stated problems and would have been obvious to those of ordinary skill in the casting art." Ans. 10.

The Appellants argue that Hoult does not disclose an arc-shaped passage. App. Br. 18-19.

We agree with the Examiner. A person of ordinary skill in the art would have selected a passage having any shape, including an arc shape, that would permit flow of the molten metal or alloy into the molds as an obvious design choice. The Appellants have not directed us to any evidence that the arc-shaped passage provides any new, let alone, unexpected result.

Claim 22:

Claim 22 recites:

> 22. Method for casting molten metal or alloy, comprising supplying a metal or alloy melt to a plurality of molds which are connected in series arrangement one after another wherein a respective mold of the series is connected by a respective first tubular melt supply member having a tubular loop segment shape communicated upstream to an ingate proximate a top of a preceding mold in the series and is connected by a respective second tubular melt supply member having a tubular loop segment shape communicated downstream to an ingate proximate a top of the next mold in the

> series, and completely filling each mold in the series before the next mold is filled.

App. Br. 36-37.

The Examiner found that Anderson's Figure 7 teaches the provision of two tubular melt supply passages to cast multiple articles simultaneously. Ans. 11. Specifically, Anderson's Figure 7 is reproduced below:

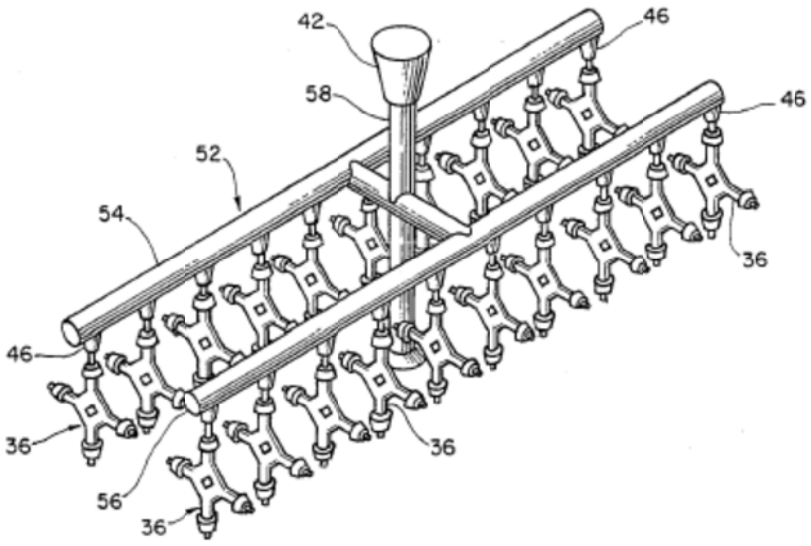


FIG. 7.

Anderson's Figure 7 shows a mold tree holding a plurality of finished molds, wherein a generally funnel shaped cup 42 at the top of the tree receives molten metal, which flows down the tree and through the horizontal gates into the mold of the tools. Col. 2, l. 65 to col. 4, l. 42. The Examiner concluded that "it would have been obvious to provide a plurality of tubular melt supply passages in the casting system of . . . Hoult to speed up the casting process." Ans. 11.

The Appellants repeat the arguments made against Hoult, adding that Anderson does not cure the perceived deficiencies of Hoult and arguing that "[t]here is no suggestion to combine, or how to combine," the two

references. App. Br. 19-20. The arguments against Hoult are unpersuasive for the reasons stated above. Regarding the combination, the Appellants do not dispute the Examiner's finding that the use of two tubular passages would have increased production. Therefore, we conclude that a person of ordinary skill in the art would have had a reason to modify Hoult to include plural tubular melt supply passages in order to increase production.

The rejection of claim 22 is affirmed.

Claim 23:

The Appellants offer the same argument made in support of claim 13, adding that Anderson does not cure the perceived deficiencies of Hoult and does not disclose sequential filling of the molds. For the same reason given above, we find the Appellants' argument against Hoult unpersuasive. As for sequential filling, that feature is described by Hoult. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

Therefore, the rejection of claim 23 is affirmed.

Claims 34, 44, 45, & 47:

The Appellants repeat the same arguments offered in support of claims 1 and 23. App. Br 21-22. We find these arguments unpersuasive for the reasons stated above.

Claims 39 & 50:

The Appellants repeat the same arguments offered in support of claims 22 and 23. App. Br. 23-24. We find these arguments unpersuasive for the reasons stated above.

Claims 40 & 51:

The Appellants repeat the same arguments offered in support of claims 13 and 23, adding that the runner-feeder 4 in Hoult resides within the rectangular bodies of the sand mold. App. Br. 24-25. We find the arguments made in support of claims 13 and 23 unpersuasive for the reasons stated above. Although Hoult discloses a sand mold, we find no error in the Examiner's conclusion that the "use [of] ceramic casting molds in lieu of sand molds for casting a plurality of cast articles in the process of Hoult is deemed to be nothing more than an obvious matter of design choice[.]" Ans. 4.

III.

Claims 1, 9 & 10:

The Examiner found that "Hagemeyer substantially shows the invention as claimed except that he use[s] sand molds instead of ceramic molds for casting a plurality of articles." Ans. 5. The Examiner found, however, that Anderson teaches "that it is conventional to use investment casting mold[s] for casting a plurality of cast articles." *Id*. The Examiner concluded from these findings that the "use [of] ceramic casting molds in lieu of sand molds for casting a plurality of cast articles in the process of Hagemeyer is deemed to be nothing more than an obvious matter of design choice, depending on the type of cast article to be obtained." *Id*. at 5-6.

The Appellants argue that Hagemeyer

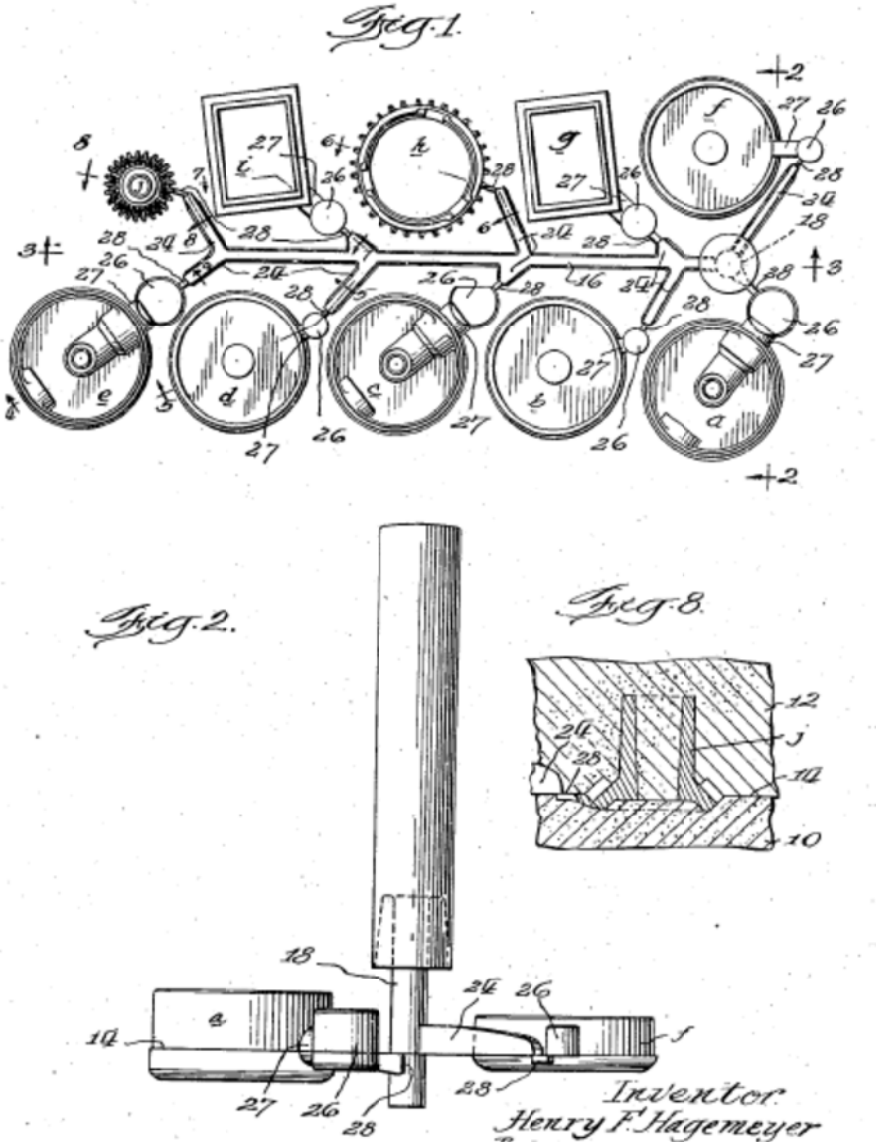
> teaches away from claim 1 in disclosing a drag 10 and cope 12 that are mated and tilted at an angle to provide uphill flow of molten metal in runner cavity 16 wherein the molten metal encounters a very small, flow-restricting orifice 28 and shrink bob cavity 26 before it enters a respective mold cavity.

App. Br. 26. The Appellants further argue that Anderson does not cure the perceived deficiency of Hagemeyer and does not disclose sequential filling of the molds. *Id*. at 26-27. According to the Appellants, a person of ordinary skill in the art would not have combined the references "given the disparate mold types and features involved." *Id*. at 27.

Thus, the dispositive issue is:

Did the Appellants demonstrate reversible error in the Examiner's conclusion that a person of ordinary skill in the art would have combined the references in the manner claimed?

We are unpersuaded by the Appellants' arguments. Hagemeyer's Figures 1, 2, and 8 are reproduced below:



Hagemeyer's Figure 1 above is "a plan view of several different types of castings shown joined to a runner and appearing as they would just after the metal has solidified"; Figure 2 is an end elevational view of the mold apparatus taken in the direction of the arrows 2–2 of Figure 1, where element 18 is the sprue, element 28 is a very small orifice that restricts the flow of metal into the mold, and element 26 is a shrink bob cavity leading into the mold impression; and Figure 8 shows the portions of the molds surrounding the respective sections of the castings along the lines 8–8 of

Figure 1, where elements 10 and 12 represent the mold halves referred to as the drag and cope, respectively. P. 1, l. 30 to p. 2, l. 2; p. 2, l. 37 to p. 3, l. 5.

The Appellants are correct that Hagemeyer's very small orifice 28 restricts the flow of metal into the mold. As we discussed above, however, the term "unobstructed" recited in claim 1 does not preclude restrictions as long as molten metal can flow into the mold. As to the Appellants' arguments that Anderson does not describe sequential filling and that Anderson's mold is different from Hagemeyer, our reasoning with respect to Rejection II as applied against claims 22 and 23 apply similarly here.

Therefore, we uphold the rejection as applied against claims 1, 9, and 10.

Claims 34-36 & 43:

For these claims, the Appellants merely repeat arguments already found unpersuasive above. App. Br. 27-28. Therefore, we uphold the rejection of these claims.

IV.

Claims 19-21, 48, & 49:

Claim 19, which we select as representative, recites: "The method of claim 1 including configuring the molds to cast directionally solidified articles therein having a plurality of columnar grains along an axis of the mold." App. Br. 36.

As previously discussed, no reversible error has been shown in the Examiner's conclusion of obviousness with respect to claim 1 in view of Hoult and Anderson. The Examiner relied on the teachings of Alleweireldt to account for the further limitation recited in claim 19.

The Appellants argue that the references cannot be combined because they are "multiple unrelated casting patents." App. Br. 29.

We do not find the Appellants' argument persuasive. The Examiner relied on Alleweireldt's teaching regarding the provision of a chill to obtain a unidirectional cast structure, thereby controlling the mechanical properties. The Appellants do not explain, much less prove, why a chill could not be used in Hoult to obtain the same or similar advantage disclosed in Alleweireldt.

Therefore, we uphold the rejection of these claims.

Claims 52, 57, 58, and 63-65:

Claim 52, which we select as representative, is reproduced below:

> 52. Metal or alloy casting, comprising a plurality of solidified metal or alloy turbine blades that are connected to the solidified gating wherein a first one of the metal or alloy turbine blades connected to the gating includes more foreign matter than the remaining of the solidified metal or alloy turbine blades connected to the solidified gating and wherein adjacent solidified turbine blades are connected top-to-top to one another by first and second solidified gatings each having a loop segment shape with respective loop segment ends connected to tops of respective adjacent turbine blades.

The Examiner relied on Alleweireldt to account for the "turbine blades" limitation recited in claim 52. Ans. 12.

The Appellants argue that the references cannot be combined because they are "multiple unrelated casting patents." App. Br. 30-31.

The Appellants' argument is unpersuasive. Because it was known to cast turbine blades having a specific structure, as shown in Alleweireldt, a person of ordinary skill in the art would have found it obvious to make

turbine blades having controlled properties using the method described in Hoult, as modified by Anderson.

Claims 66 & 67:

The Appellants repeat the same or similar arguments already addressed above. Therefore, we affirm the rejection of these claims for the same or similar reasons.

SUMMARY

The Examiner's rejection under 35 U.S.C. § 102(b) of claims 68 and 69 as anticipated by Alleweireldt is reversed.

The Examiner's rejection under 35 U.S.C. § 103(a) of claims 1-8, 13, 15, 16, 18, 22, 23, 34, 39, 40, 44, 45, 47, 50, and 51 as unpatentable over Hoult and Anderson is affirmed.

The Examiner's rejection under 35 U.S.C. § 103(a) of claims 1, 9, 10, 34-36, and 43 as unpatentable over Hagemeyer and Anderson is affirmed.

The Examiner's rejection under 35 U.S.C. § 103(a) of claims 19-21, 48, 49, 52, 57, 58, and 63-67 as unpatentable over Hoult, Anderson, and Alleweireldt 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-IN-PART

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