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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte KENNETH CHARLES SARIEGO and
JOEL ANDREW SCHULTES

Appeal 2017-004522
Application 13/690,642
Technology Center 1700

Before ROMULO H. DELMENDO, BEVERLY A. FRANKLIN, and JANE E. INGLESE, *Administrative Patent Judges*.

DELMENDO, *Administrative Patent Judge*.

DECISION ON APPEAL

The Applicants (hereinafter "Appellants")[1] appeal under 35 U.S.C. § 134(a) from the Primary Examiner's final decision to reject claims 1–9, 11, 21, and 22.[2] We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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[1] The Appellants identify the real party in interest as "Corning Incorporated" (Appeal Brief filed June 27, 2016, hereinafter "Appeal Br.," 2).

[2] Appeal Br. 8–20; Reply Brief filed January 20, 2017, hereinafter "Reply Br.," 2–5; Final Office Action entered December 3, 2015, hereinafter "Final Act.," 3–7; Examiner's Answer entered November 21, 2016, hereinafter "Ans.," 2–8.

I. BACKGROUND

The subject matter on appeal relates to a method for extruding a ceramic precursor batch material, wherein the method uses temperature control (Specification filed November 30, 2012, hereinafter "Spec.," ¶ 1). Figure 1A, which is illustrative of the claimed subject matter, is reproduced as follows:

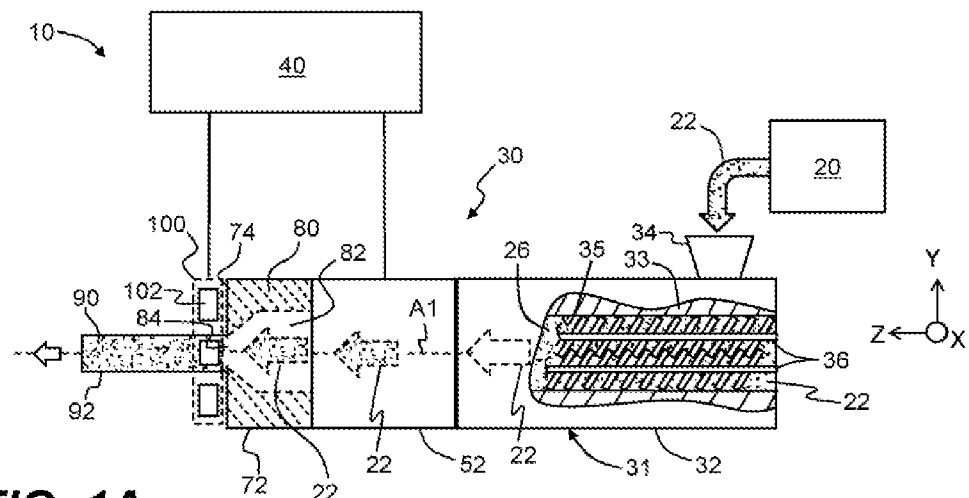

FIG. 1A

Figure 1A above depicts an exemplary extrusion system **10** and a method for its operation in accordance with the Appellants' disclosure, wherein the method comprises: supplying a ceramic batch material **22** into an extruder **30**'s barrel **31** via an input funnel **34**; pushing the ceramic material **22** through a cavity **26** towards an extrusion die **80** by rotating extrusion screws **36**; and extruding an extrudate **90** out of an output end **74** (Spec. ¶¶ 27–30). As shown in Figure 1A, the system **10** is provided with a temperature-sensing unit **100**, which is connected to a temperature control system **40** and is provided with multiple temperature sensors **102** (*id.* ¶ 32). The Appellants further describe a plurality of temperature sensors **152** (not shown in Figure

1A) that are azimuthally arranged adjacent heating elements **150** (not shown in Fig. 1A) in the extruder **30**'s front section **52** (*id.* ¶ 33; Fig. 2A).

Representative claim 1 is reproduced from the Claims Appendix to the Appeal Brief (Appeal Br. 21), with key limitations emphasized and some line spacing added, as follows:

> 1. A method of controlling a shape of an extrudate made of ceramic batch material extruded from an extrusion die of an extruder, comprising:
>
> flowing the ceramic batch material through an extruder cavity defined by an inner surface of a barrel wall immediately adjacent the extrusion die, wherein the batch material has a temperature and wherein the cavity has a central axis and defines a perimeter of the ceramic batch material;
>
> locally adjusting the temperature of the ceramic batch material that resides within the extruder cavity through the batch material perimeter at multiple locations, to form a temperature-adjusted ceramic batch material;
>
> ***measuring the temperature of the barrel wall, wherein the local measuring is performed at multiple locations around the perimeter of the ceramic batch material within the extruder cavity***;
>
> extruding the temperature-adjusted ceramic batch material through an output end of the extrusion die to form the extrudate, with the extrudate having an outer surface;
>
> ***measuring temperatures of the extrudate at the output end of the extrusion die at multiple outer surface locations of the extrudate having different azimuthal positions***; and
>
> controlling the local adjusting of the temperature of the ceramic batch material based on the measured temperatures of the barrel wall and the measured temperatures of the extrudate at the output end of the die to control the shape of the extrudate.

II. REJECTIONS ON APPEAL

On appeal, the Examiner maintains two rejections under pre-AIA 35 U.S.C. § 103(a) as follows:

A. Claims 1–6, 9, 11, 21, and 22 as unpatentable over Yamaguchi et al.[3] (hereinafter "Yamaguchi") in view of Bessemer et al.[4] (hereinafter "Bessemer") and Togawa et al.[5] (hereinafter "Togawa"); and

B. Claims 7 and 8 as unpatentable over these same prior art references further in view of two additional references.

(Ans. 2–6; Final Act. 3–7.)

III. DISCUSSION

Rejection A. The Appellants argue the claims together, focusing only on claim 1 (Appeal Br. 9–19). Therefore, we confine our discussion to claim 1, which we select as representative pursuant to 37 C.F.R. § 41.37(c)(1)(iv). As provided by this rule, claims 2–6, 9, 11, 21, and 22 stand or fall with claim 1.

1. The Examiner's Position

The Examiner finds that Yamaguchi describes a method including every limitation recited in claim 1, except for the disputed limitations highlighted in reproduced claim 1 above (Ans. 2–3). Regarding the extrudate temperature measurement limitations, the Examiner finds that Yamaguchi teaches a temperature control system that uses non-contact temperature sensors (*id.* at 2), but acknowledges that the reference "does not

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[3] US 2002/0167102 A1, published November 14, 2002.
[4] US 6,620,354 B1, issued September 16, 2003.
[5] US 4,480,981, issued November 6, 1984.

teach measuring the temperature of the extrudate at multiple outer surface locations at different locations around the cross section of the extrudate" (*id.* at 3). The Examiner finds, however, that Bessemer teaches using non-contact temperature sensors located at different positions around a cross-section of an extrudate to provide feedback to a controller in order to allow precise control of each cooling circuit used in an extrusion process (*id.*). Based on these findings, the Examiner concludes that the person of ordinary skill in the art would have combined Yamaguchi and Bessemer in the manner claimed by the Appellants (*id.*).

Regarding the barrel wall temperature measurement limitations, the Examiner finds that "Yamaguchi recognizes the importance of [controlling] the extruder barrel temperature profile (¶[¶] 0069-0070) but does not go into detail with regards to the sensors used by the controller[,] prompting one of ordinary skill to look to related art" (*id.* at 7–8). The Examiner finds that Togawa teaches using a plurality of temperature sensors around the perimeter of an extruder barrel's cross-section and along multiple points throughout the barrel's length in order to improve measurement and control of the temperature of material being conveyed within the extruder barrel (*id.* at 3–4). Based on these findings, the Examiner concludes that a person of ordinary skill in the art would have implemented Togawa's improved barrel temperature control system in Yamaguchi "because both relate to the extrusion of materials under controlled temperature environments presenting a reasonable expectation of success, and the system of Togawa teaches improved process control of the internal temperature of the extruder" (*id.* at 4).

2. *The Appellants' Contentions*

With respect to the extrudate temperature measurement limitations, the Appellants contend that the extrusion system described in the Specification (¶ 32) and Drawings (Fig. 1A) includes a temperature-sensing unit **100** arranged adjacent an extruder output section **72** at output end **74** with no intervening elements disposed between the temperature sensing unit **100** and output end **74** (Appeal Br. 11–12). The Appellants argue that, by contrast, Bessemer's temperature sensors **143–145** "cannot be reasonably interpreted as being capable of 'measuring temperatures of the extrudate at the output end of the extrusion die,' as recited by independent claim 1" (*id.* at 12). Specifically, the Appellants urge that Bessemer's temperature sensors **143–145** are arranged in air gaps **77** between calibrators **140** (*id.* at 13). According to the Appellants, "because Bessemer teaches using the temperature sensors to determine if the extrudate has properly cooled at the blade, one of ordinary skill in the art would not have been motivated to move the temperature sensors of Bessemer to be at the exit of the extruder as taught by Yamaguchi" (*id.* at 14).

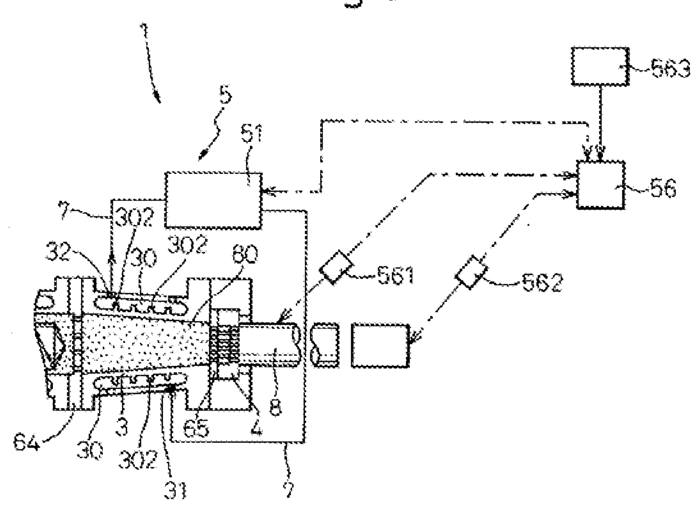
Regarding the barrel temperature measurement limitations, the Appellants contend that "none of the cited references, alone or in combination, teach controlling the temperature based on both the measured temperatures of the barrel wall and the measured temperatures of the extrudate at the output end of the die" (*id.* at 15). The Appellants contend that "[a]lthough Yamaguchi discloses measuring the temperature of the extrudate as it exits the mold and Togawa teaches measuring the temperature of molten resin in a cylinder," none of the references disclose or suggest the disputed limitations (*id.* at 16). The Appellants further argue that the person of ordinary skill in the art would not have combined Yamaguchi, which takes account of a temperature difference between the extrudate's outer peripheral portion and inner peripheral portion as it exits the mold, with Togawa's technique for measuring temperature because "[t]he two temperature measuring and control systems are not compatible with one another" (*id.* at 18).

3. *Analysis*

The Appellants' arguments fail to reveal any reversible error in the Examiner's rejection. *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011).

Yamaguchi describes a method for producing a ceramic molding having a desired shape using a screw-type extruder with controlled heating or cooling to improve the ceramic molding's shape (Yamaguchi, ¶¶ 15–16). Yamaguchi discloses an embodiment in Figure 9, as follows:

Fig.9



Yamaguchi's Figure 9 above depicts an apparatus **1** including, *inter alia*, two molding thermometers **561** and **562** for measuring "the temperature of the outer peripheral surface of the as-extruded ceramic molding **8** extruded from the mold **4**" and "the temperature of the cut center of the extruded ceramic molding **8**," respectively (*id.* ¶ 97). Yamaguchi teaches that these thermometers **561**, **562** are connected to a heat medium temperature instruction device **56** to control the temperature using temperature controller **52** (not shown) for heating or cooling heat medium **7** and to help shape the ceramic molding (*id.* ¶¶ 56, 98–99, 105). Yamaguchi also teaches the importance of controlling the ceramic material's temperature within the extruder screw chamber from being elevated by heat of friction generated between the ceramic material and the extrusion screw (*id.* ¶¶ 69–70).

Yamaguchi's method differs from claim 1's subject matter in two respects. First, although Yamaguchi teaches the importance of controlling the ceramic material's temperature within the screw chamber (*id.*), it does not teach measuring the temperatures of the barrel wall at multiple locations around the ceramic material's perimeter within the extruder cavity. Second, although Yamaguchi teaches measuring "the temperature of the outer peripheral surface of the as-extruded ceramic molding **8** extruded from the mold **4**" (*id.* ¶ 97), it does not teach "measuring [the] temperatures of the extrudate at the output end of the extrusion die at multiple outer surface locations of the extrudate having different azimuthal positions," as recited in claim 1. We conclude, however, that a person of ordinary skill in the art would have found these differences obvious in view of the prior art teachings as a whole.

We start with the second difference (i.e., the limitation "measuring temperatures of the extrudate at the output end of the extrusion die at multiple outer surface locations of the extrudate having different azimuthal positions" in claim 1). As we found above, Yamaguchi explicitly teaches using thermocouple **561** to measure "the temperature of the outer peripheral surface of the as-extruded ceramic molding **8** extruded from the mold **4**" (Yamaguchi, ¶ 97). We find that, under the broadest reasonable interpretation of the limitation at issue, Yamaguchi discloses measuring the extrudate temperature "at the output end of the extrusion die" as required by claim 1. Although the Appellants argue that the Specification (¶ 32) and the Drawings (Figure 1A) show a temperature sensing unit arranged at the output end "with no intervening elements disposed therebetween" (Appeal Br. 12), the claim recites no such requirement.

Even if Yamaguchi cannot be considered as disclosing measuring the extrudate temperature at the extruder die's output end, a person of ordinary skill in the art would have found it obvious to measure the temperature at precisely the die's output end because the reference places no particular limitation on the exact location for measuring the extrudate's surface temperature. Indeed, a person of ordinary skill in the art would have been prompted to take temperature measurements at or close to the die outlet in order to supplement any temperature monitoring/control system implemented for Yamaguchi's extruder cylinder (as discussed further below).

Regarding measuring extrudate temperatures at different azimuthal positions, Bessemer discloses the concept of providing multiple temperature sensors azimuthally to enhance temperature control in a uniform manner, especially for complex, multi-sided extrudates (Bessemer, col. 7, ll. 32–63; Fig. 4). Therefore, a person of ordinary skill in the art would have provided multiple temperature sensors at different azimuthal positions, as shown in Bessemer, to measure Yamaguchi's extrudate temperature at the die outlet with the reasonable expectation of achieving enhanced, uniform temperature control. The fact that Bessemer teaches providing temperature sensors between air gaps does not negate an obviousness conclusion because, consistent with the Examiner's position (Ans. 6–7), obviousness must be analyzed based on the *collective* teachings of the prior art references. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (nonobviousness cannot be established merely by attacking references individually where the rejection is based on the collective teachings of multiple prior art references).

Next, we address the first difference between Yamaguchi and claim 1's subject matter (i.e., measuring extruder barrel wall temperatures at multiple points around the ceramic material's perimeter within the extruder cavity). Togawa teaches a resin extrusion system in which thermocouples **4***a*, **4***b*, and **4***c* are mounted into holes **3***a*–**3***c* in an extruder's cylinder **2** in order to obtain the temperature profiles of the cylinder **2** at different regions $\mathbf{C}_1$–$\mathbf{C}_4$ (Togawa, col. 5, l. 62–col. 6, l. 23; Fig. 5). According to Togawa, the resin temperature within the extruder's

> cylinder can be accurately estimated so as to be always controlled to an optimum temperature, whereby the increase of amount of extrudate, the reduction of scorching of the resin, the saving of the energy and the prevention of wear of temperature detecting elements are achieved, so that the extruder can be continuously operated for a long period of time.

(*Id.* at col. 4, ll. 32–32).

Given these teachings, a person of ordinary skill in the art would have been prompted to implement Togawa's improved temperature measurement and control system in Yamaguchi's extrusion method for ceramic materials with a reasonable expectation of obtaining the same or similar improvements disclosed in Togawa for resin extrusion. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007) ("[I]f 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.”).

The Appellants’ argument that a person of ordinary skill in the art would not have combined Yamaguchi and Togawa because these references are incompatible is without merit. We have not been directed to any factual basis for concluding that the advantages disclosed in Togawa cannot be attained by supplementing Yamaguchi’s temperature control system with Togawa’s improved system.

For these reasons, we uphold Rejection A.

Rejection B. For claims 7 and 8, the Appellants rely on the same arguments offered in support of claim 1, adding only that the additional references do not cure the alleged “deficiencies” in Yamaguchi, Bessemer, and Togawa. Because we perceive no deficiency in the Examiner’s rejection of claim 1, we also sustain Rejection B.

IV. SUMMARY

Rejections A and B are sustained. Therefore, the Examiner’s final decision to reject claims 1–9, 11, 21, and 22 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