Appeal decision

Appeal No. 2014-4387

USA
Appellant GENERAL ELECTRIC COMPANY

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The case of appeal against the examiner's decision of refusal of Japanese Patent No. 2007-163248, entitled "Method for forming casting mold" (the application published on January 17, 2008, Japanese Unexamined Patent Application Publication No. 2008-6502) has resulted in the following appeal decision.

Conclusion

The appeal of the case was groundless.

Reason

[1] History of the procedures

The application was filed on June 21, 2007, (Priority Date under the Paris Convention, June 28, 2006, USA), a decision for refusal was issued on October 29, 2013, an appeal against the examiner's decision of refusal was requested on March 6, 2014 and simultaneously with submission of the written amendment, a notice of reasons for refusal was issued by the body on March 2, 2015, and the written opinion and the written amendment were submitted on May 29, 2015.

[2] The Invention

It is acknowledged that the invention relating to Claims 1-10 of the present application is specified in accordance with matters described in Claims 1-10 of the scope of claims for patent amended by the written amendment dated May 29, 2015, and the invention relating to Claim 1 is as follows.

"A method for forming a mold comprising:

casting molds (8, 10) which have concave surfaces (24);

forming a surface structure which includes a mixture (26) on the concave surfaces (24);

heating the molds (8, 10);

correcting the surface structure by using a direct writing technology; and

heat-treating the mixture (26) to form the surface structure of a ceramic tool for casting." (hereinafter, referred to as the "Invention").

[3] Described matters in the Cited Publication

Japanese Unexamined Patent Application Publication No. 2005-320235 (hereinafter, referred to as the "Cited Publication") distributed in Japan before the priority date of the application, which is cited for reasons for refusal notified in the body, describes as follows (underlines are drawn by the body).

(1a) "[0016]

In the invention, various metallic component parts can be used. ...The component parts are usually articles which are exposed to high temperature, and therefore need cooling. The component parts also need a certain kind of an internal channel. As described above, a turbine engine aerofoil is a main example.

[0017]

The ceramic core used for forming the internal channel of the metallic component parts is well known in the technical field. Such ceramic cores are used in the investment casting of a directional solidification eutectic alloy and superalloy material in many cases...."

(1b) "[0020]

As understood by a person skilled in the art, the core may be manufactured by an injection molding method or a transfer molding method. In many cases, the cores are produced from ceramic slurry. As one non-restrictive example, the core can be

produced from the ceramic slurry composed of a liquid which can be solidified, ceramic powders, and a gelling agent, as described in Japanese Unexamined Patent Application Publication No. H02-188460. The slurry composition is introduced in the molding cavity of a core form, and then solidified and gelatinized. Next, the molded "green (non-burned product)" is heated according to a suitable temperature and time schedule, and a sintering ceramic core is obtained as a result."

(1c) "[0021]

As described above, the ceramic core, when assembled in a shell mold used for an investment molding method or a similar method, forms an internal "hollow" area of the metallic component parts. A positive (namely, upheaved on the surface) feature portion deposited on the core according to the present invention forms a required detent portion in the internal area of the component parts. Figure 1 explains this mode of the present invention with a simple form. Ceramic material is deposited on the surface 14 of the ceramic core 16 as a series of the positive feature portions 12. A conical shape is indicated in the figure. After the deposition, the ceramic material is heat-treated so that the material is sintered and securely united on the core surface 14 as described below."

(1d) "[0024]

As described above, a direct writing method is used for depositing the ceramic material forming the positive feature portion on the surface of the core. The direct writing method is publicly known in the technical field, and is described in many cited documents...."

(1e) "[0046]

Figure 3 provides an explanatory view of the whole of the robot pen system 100 constituted so as to supply an optional preferable material 102 onto the surface of an optional preferable workpiece 104 (namely, the ceramic core) as a flow. Although the core may have a simple two-dimensional (2D) structure such as a flat plate, more generally, it will have a changing curved surface; namely, a complicated three-dimensional (3D) structure whose outline changes along three axes. The core can also include various internal areas such as a cavity, a hole, an indentation, and articles the same as these. However, for convenience in the explanation of the specifications, the core is illustrated as having a comparatively simple shape."

(1f) "[0054]

After the deposition material is coated on the surface of the core, any volatile components (for example, a binding material, a solvent, and a component similar to this) are removed, and a heat-treatment is performed so as to solidify and strengthen the material. The deposited material can be heat-treated alone or with the core. An exemplary heat-treatment includes heating by convergence energy sources such as plasma, laser, and electron beam heating, or heating by any other local sources. Alternatively, the heat-treatment can be performed in a furnace, when temperature is low enough to avoid damage to the core. The heat-treatment can be performed at a predetermined "sintering" temperature, or according to an optional gradual schedule. Furthermore, if the material is deposited in more than one layer, the heat-treatment can be performed between each round of depositing work."

The Cited Publication describes that the ceramic core used in the investment casting of the hollow turbine engine aerofoil (namely, a hollow turbine blade) is manufactured (namely, casted) by the injection molding method and the like, according to the description matters (1a)-(1c) mentioned above; that the ceramic material is deposited on the ceramic core surface by the direct writing method according to the description matter (1d) mentioned above; and that the ceramic material is heat-treated with the core to form the positive feature portion according to the description matters (1d) and (1f) mentioned above.

[4] The Cited Invention

According to the above description matters and detection matters, the Cited Publication describes "a method for forming a ceramic core used in the casting of a hollow turbine blade, comprising:

casting the ceramic core;

depositing ceramic material on the core surface by using a direct writing method; and

heat-treating the ceramic material with the core to form a positive feature portion." (hereinafter, referred to as the "Cited Invention").

[5] Comparison/judgment

In comparison of the Invention and the Cited Invention, it can be acknowledged that "the mold" in the Invention corresponds to, for example, molds used in the casting of the hollow turbine blade, the so-called "main mold" (refer to drawings of the

Invention), while it can be said that "the ceramic core" in the Cited Invention corresponds to the so-called "core" of the molds.

Therefore, "the mold" in the Invention and "the ceramic core" in the Cited Invention are common in that both configure "the mold" used when casting the hollow turbine blade.

Then, according to the description of [0031] in the specification of the Invention, "the mixture" in the Invention may be "ceramic," so that "depositing the ceramic material" in the Cited Invention corresponds to "forming a surface structure which includes the mixture (26)" in the Invention, and "the positive feature portion" in the Cited Invention correspond to "the surface structure of a ceramic tool" in the Invention.

Consequently, the two are common in the point of "a method for forming a mold comprising: casting a mold;

forming a surface structure which includes a mixture, on a surface of the mold; and

heat-treating the mixture to form a surface structure of a ceramic tool for casting," and are different in the following points.

(The different feature 1)

The Invention corresponds to "the main mold" "having a concave surface" in the mold, whereas the Cited Invention is "the ceramic core."

(The different feature 2)

After forming the surface structure which includes the mixture, the Invention includes "heating the molds (8, 10), and correcting the surface structure by using a direct writing technology," whereas there is no description about that in the Cited Invention.

The above different features will now be discussed below.

• Regarding the different feature 1

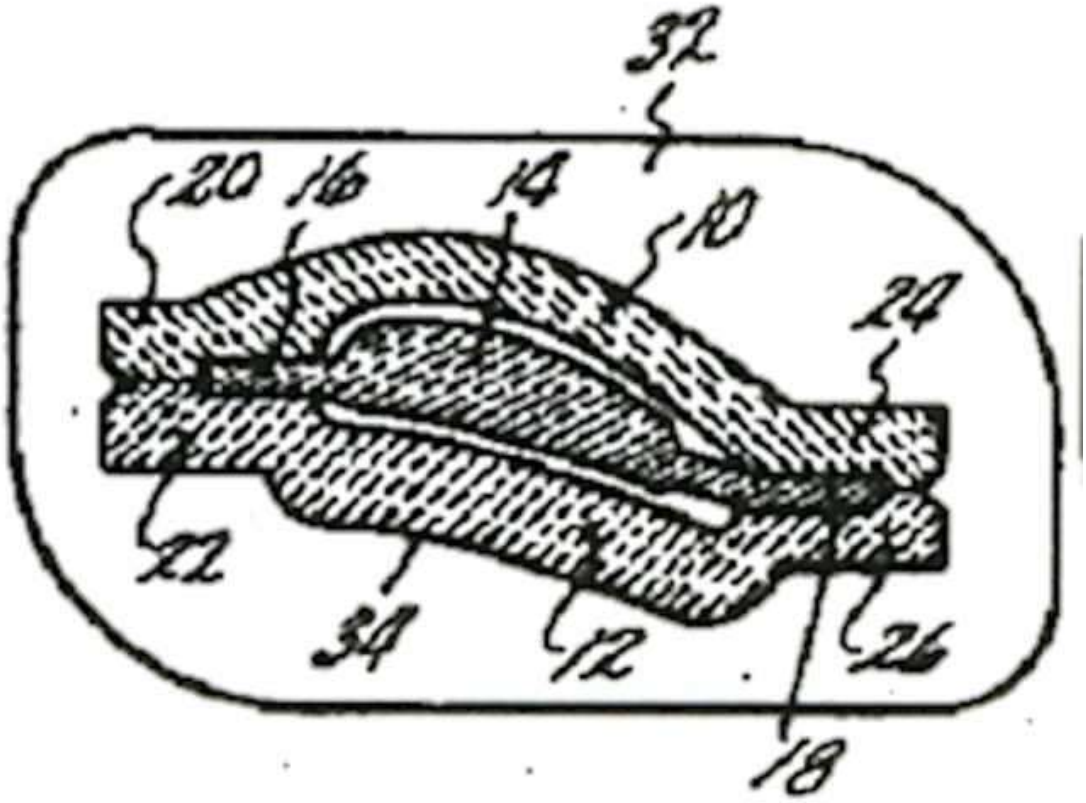
The Cited Invention forms the surface structure to the core determining a shape of an inner peripheral surface of the hollow turbine blade, and a shape of an outer peripheral surface of the hollow turbine blade is determined by the main mold having the concave surface (for example, refer to the following well-known example 1). It is a well-known technology suitably practiced that a large number of dimples (depressions) are provided on the outer peripheral surface (for example, refer to the

following well-known example 2), so that it could be easily conceived by a person skilled in the art that "the main mold" "having the concave surface" is adopted instead of the ceramic core (the core) of the Cited Invention and made to be matters specifying the invention relating to the different feature.

A. Well-known example 1: Japanese Unexamined Patent Application Publication No. S51-59723

"Referring to Fig. 1 and 2, a desirable multiplex portion mold...is illustrated as an example forming each opposite half piece portion of a turbine blade (a turbine blade). The mold includes opposite mold sides 10 and 12 in which suitable ceramic molding is executed, and a center isolating portion 14 of the ceramic." (Page 2, lines 5-11 of upper right section)

"FIG. 2



According to Fig. 2, it can be seen that the two opposite molds 10 and 12 respectively have concave surfaces."

B. Well-known example 2 : U.S. Patent No. 6183197 specifications

"The present invention also contemplates a method of reducing heat load on a turbine or

compressor airfoil by forming at least one heat reducing dimple in the body of the airfoil." (Lines 26-29 of the 2nd section)

"The present invention is useful with an airfoil made of solid metal or one that has an interior 40 which is hollow, as shown in FIG. 7. If airfoil 15, 17 are solid, then dimple 30 will simply be an indentation in the surface of airfoil 15, 17 as shown in FIGS. 8A and 8B." (line 3 from the bottom in the 4th section - line 2 of the 5th section)

"

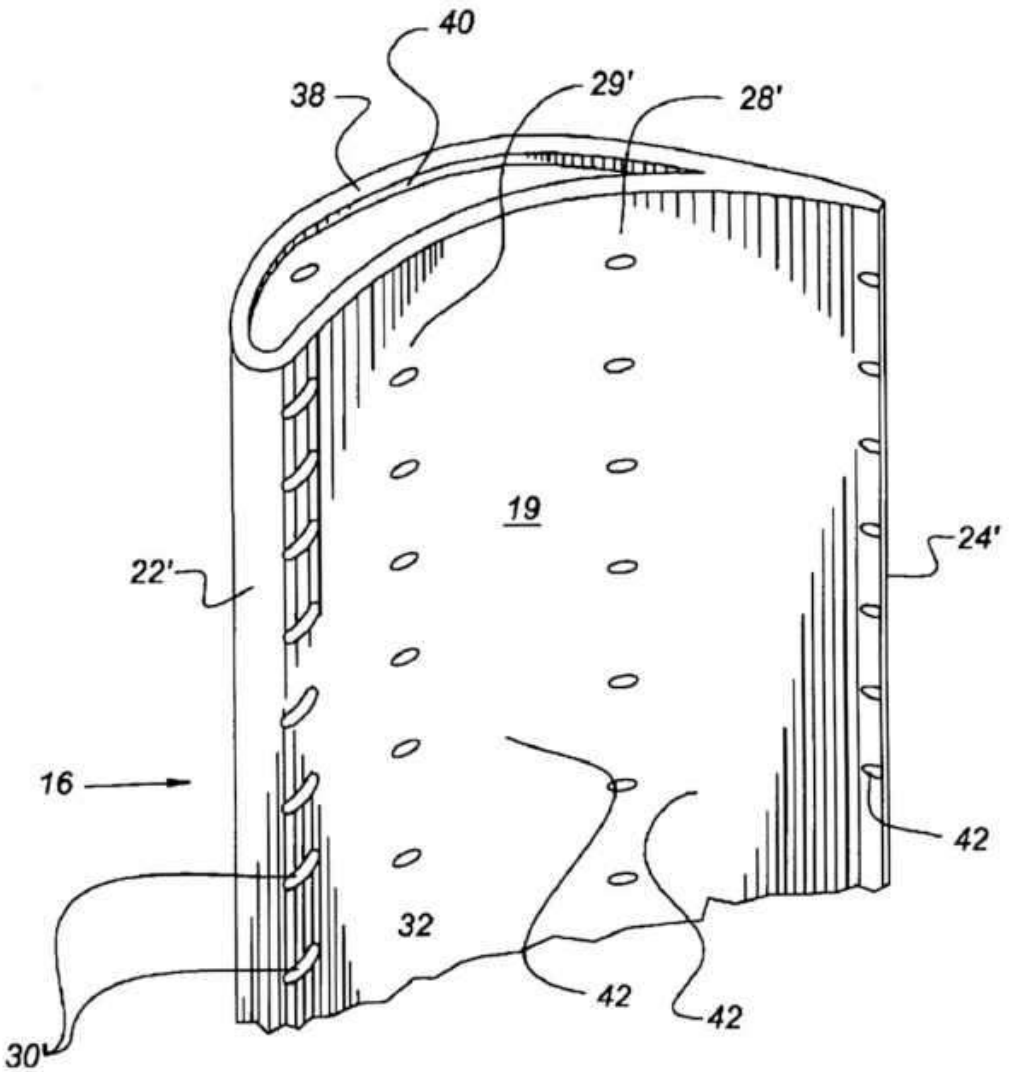


Fig. 7"

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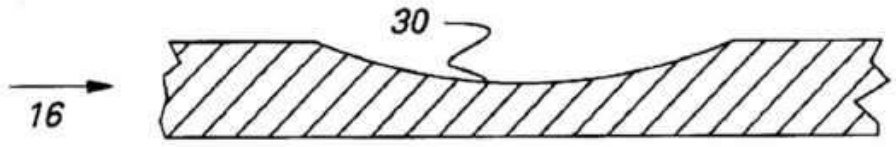

Fig. 8a"

• Regarding the different feature 2

According to the description described matters (1d)-(1f) above, in the Cited Publication, it is described that, when the ceramic material constituting the positive feature portion is deposited in more than one layer, the heat-treatment is performed between each round of depositing work. For example, in a case of two layers, it can be said that there is a description that "the depositing/heat-treatment of the ceramic material by the direct writing method (a direct write method)" are repeated to successively form two layers of the deposit layers of the ceramic material, thereby forming the final positive feature portion (corresponding to "the surface structure").

On the other hand, the Invention forms the surface structure which includes the mixture (26), corrects the surface structure (by using the direct writing technology) after heating the mold, and then performs heat-treatment to form the surface structure of the ceramic tool for casting. This does not actually differ from the fact that "the depositing/heating (heat-treatment) of the mixture (26)" are repeated to form the final surface structure of the ceramic tool for casting, so that if the above description matters are applied, it can be said that the Cited Invention actually becomes the structure relating to the different feature, and even if it is not so, that is a design matter which could be properly chosen by a person skilled in the art.

Then, it cannot be acknowledged that the Invention takes a particular effect which cannot be expected from the descriptions of the Cited Publication and the well-known matters.

Therefore, the Invention could be easily invented by a person skilled in the art on the basis of the Cited Publication and the well-known example 1 and 2.

[6] Conclusion

As described above, the appellant should not be granted a patent for the Invention in accordance with the provisions of Article 29(2) of the Patent Act.

Therefore, the present application should be rejected.

Consequently, the appeal decision shall be made as described in the conclusion.

August 28, 2015

Chief administrative judge: KIMURA, Koichi

Administrative judge: SUZUKI, Masaki

Administrative judge: OGAWA, Susumu