Appeal decision

Appeal No. 2019-5784

Appellant	Advanced Composite Corporation
Patent Attorney	KONDO, Rieko
Patent Attorney	SUGANO, Shigeyoshi
Patent Attorney	TAKEYAMA, Keita
Patent Attorney	OKADA, Kaoru

The case of appeal against the Examiner's decision of refusal of Japanese Patent Application No. 2017-229851, entitled "PRODUCTION METHOD FOR ALUMINUM ALLOY-BASED COMPOSITE MATERIAL, AND ALUMINUM ALLOY-BASED COMPOSITE MATERIAL" [Japanese Unexamined Patent Application Publication No. 2019-99850 published on June 24, 2019, the number of claims (7)] has resulted in the following appeal decision.

Conclusion

The examiner's decision is revoked.

The invention of the present application shall be patented.

Reasons

No. 1 History of the procedures

The application of the case was filed on November 30, 2017. A notice of reasons for refusal was issued on September 20, 2018, and a written amendment was submitted on November 14, 2018. A final notice of reasons for refusal was issued on November 28, 2018. A written amendment was submitted on January 15, 2019. The amendment was dismissed and the decision of refusal was made on February 4, 2019 (hereinafter, referred to as the "Examiner's decision"). In response, the appeal against the Examiner's decision of refusal was made, and at the same time a written amendment was submitted on May 7, 2019. A body's notice of reasons for refusal was issued on December 12, 2019. A written amendment was submitted on December 27, 2019.

No. 2 Outline of the decision of dismissal of the amendment, the Examiner's decision, and the body's notice of reasons for refusal

1. Outline of the decision of dismissal of the amendment dated February 4, 2019

The amendment of Claim 7 according to the written amendment dated January 15, 2019 intends to restrict it by limitation. However, the invention recited in Claim 7 after amendment could have been easily invented by a person having ordinary skill in the art to which the invention pertains (hereinafter, referred to as "a person skilled in the art") on the basis of an invention disclosed in Cited Document 1 listed below. The amendment should be dismissed since the invention could not have been patented independently at the time of filing of the patent application.

Cited Document 1: Japanese Unexamined Patent Application Publication No. H9-192819

2. Outline of the Examiner's decision

While the written amendment dated January 15, 2019 has been dismissed, the invention recited in Claim 7 of the Scope of Claims, which has been amended by the written amendment dated November 14, 2018, could have been easily invented by a person skilled in the art based on the invention recited in the above Cited Document 1. Therefore, the Appellant should not be granted the Patent for the invention recited in Claim 7 under the provisions of Article 29(2) of the Patent Act. Further, at present, no grounds are discovered for rejection of the inventions recited in Claims 1 to 6.

3. Outline of the body's notice of reasons for refusal

Claim 7 of the Scope of Claims, which has been amended by the written amendment dated May 7, 2019, recites that "ceramic powder as a reinforcing material is compounded in an aluminum alloy in which ceramic powder as a reinforcing material is uniformly dispersed and distributed in an aluminum alloy matrix." Due to this statement, the invention for which the applicant requests the grant of a patent is unclear. Therefore, it does not comply with the provision of Article 36(6)(ii) of the Patent Act.

No. 3 The present Invention

The invention recited in Claim 7 became clear after the above underlined phrase was deleted according to the written amendment dated December 27, 2019 submitted in response to the above body's notice of reasons for refusal. Then, the inventions recited in Claims 1 to 7 of the present application are specified by the matters according to

Claims 1 to 7 of the Scope of Claims as amended by the written amendment as follows (hereinafter, respectively referred to as "Invention 1" to "Invention 7"):

"[Claim 1]

A method for producing an aluminum alloy-based composite material in which ceramic powder as a reinforcing material is composited in an aluminum alloy, the method comprising:

a filling step in which the ceramic powder is filled in a porous container made of a porous material, and the porous container is sealed by a lid;

a step of installing in a mold the porous container and pouring a molten aluminum alloy into the mold; and

an impregnation step in which pressure is applied to the molten metal in the mold to impregnate the ceramic powder inside with the molten metal through the porous container.

[Claim 2]

The method for producing an aluminum alloy-based composite material according to Claim 1, wherein

the porous container is made of carbon graphite.

[Claim 3]

The method for producing an aluminum alloy-based composite material according to Claim 1 or 2, comprising:

a preheating step of preheating the porous container after the filling step.

[Claim 4]

The method for producing an aluminum alloy-based composite material according to any one of Claims 1 to 3, wherein

the ceramic powder is aluminum borate powder.

[Claim 5]

The method for producing an aluminum alloy-based composite material according to Claim 4, wherein

SiC powder is further added as the ceramic powder.

[Claim 6]

The method for producing an aluminum alloy-based composite material according to Claim 5, wherein

in the filling step, the SiC powder is mixed in the aluminum borate powder in a ratio of 0.5 to 2.0: 20.

[Claim 7]

An aluminum alloy-based composite material obtained by the method for producing an aluminum alloy-based composite material according to any one of Claims 1 to 6, wherein

ceramic powder as a reinforcing material is uniformly dispersed and distributed in an aluminum alloy matrix,

the ceramic powder is an aluminum borate powder or a mixed powder of aluminum borate powder and silicon carbide, and

the vibration-damping property thereof has faster damping and less noise in the damping waveform, as compared with the vibration-damping property of aluminum."

No. 4 Cited Documents and Cited Invention

1. Regarding Cited Document 1

(1) Cited Document 1 cited in the reasons for refusal stated in the Examiner's decision discloses the following matters: Underlines were added by the body.

"[Scope of Claims]

[Claim 1] A method for producing a wear-resistant composite material cast product in which a wear-resistant material with excellent wear resistance is cast inside the cast product, the method comprising: covering the wear-resistant material with a metal-packaging material that melts with the heat of a molten metal; placing the material in a predetermined place in a mold; and casting the molten metal.

[Claim 2] The method for producing a wear-resistant composite material cast product, wherein the wear-resistant material has a particle shape."

"[0005]

[Means for solving the problem]

As a result of conducting extensive studies, the present inventors have confirmed by experiments that casting a wear-resistant solid metal different from cast steel causes heat capacity and heat transfer of the solid metal to deprive molten metal near the connection portion of a great amount of heat and then leads to poor welding between the cast molten metal and the wear-resistant solid metal and poor adhesion, resulting in loss of the wear-resistant solid metal. After further studies, the present inventors have found that it is effective to cover the wear-resistant material with a metal-packaging material that melts with the heat of the molten metal in order to prevent the occurrence of such defects."

"[0008] The metal-packaging material that covers the wear-resistant material used in the present invention may be a metal of the same type as the molten metal to be cast, and is, for example, stainless steel or mild steel. The shapes of the covering material include a wire mesh, a thin metal plate with holes punched, and a thin metal plate without holes. It is preferably wrapped in a grid-like wire mesh in a sandwich shape. The present invention wraps a wear-resistant material in a metal-packaging material and places it in a mold to allow the amount of heat of the molten metal injected into the mold to melt the metal packaging material to improve the circulation of the molten metal. Further, the molten metal of the packaging material wraps the wear-resistant material, and the injected molten metal further wraps it, so that the wear-resistant material is surely welded and can be cast with good adhesion. In the present invention, when the wear-resistant material is wrapped with the metal-packaging material, it may be wrapped inside the mold or outside the mold."

"[0010] The wear-resistant material used in the present invention is not particularly limited, and has a particle shape but is not limited to such a shape. The particle-like shape may be an irregular-shape variant as long as the particles can be arranged at equal intervals on the wire mesh and are uniformly cast by the molten metal, and the spherical shape is particularly suitable."

(2) According to the indicated matters in the above (1), it is recognized that Cited Document 1 discloses the following invention.

(Cited Invention)

"A wear-resistant composite material cast product obtained by a method for producing a wear-resistant composite material cast product, the method comprising: covering the wear-resistant material with a metal-packaging material that melts with the heat of a molten metal; placing the material in a predetermined place in a mold; and casting the molten metal."

2. Regarding Cited Document 2

Japanese Unexamined Patent Application Publication No. 2011-137186 cited in the examiner's reconsideration report (hereinafter, referred to as "Cited Document 2") includes the following descriptions:

"[Detailed Description of the Invention]

[Technical field]
[0001]

The present invention relates to a method for producing a metal-ceramic composite material using a metal as a base material and ceramics as a reinforcing material."

"[0010]

The present invention has been made in view of such a problem, and an object of the present invention is to provide a method for producing a metal-ceramic composite material capable of increasing the filling uniformity and filling rate of ceramic particles.
[Means for solving the problem]
[0011]

For solving the above problem,
the present invention provides a method for producing a metal-ceramic composite material obtained by impregnating a preform using ceramic particles as a reinforcing material with a base metal, wherein

the process for forming the preform includes the steps of:

obtaining a non-fluid mixture in a stationary state by

mixing ceramic particles with a binder using water as a dispersion medium;

placing the mixture into a mold and applying vibration to develop fluidity to settle the ceramic particles in the mixture to obtain a molded product containing the ceramic particles, water, and a binder component;

freeze-curing the molded product together with the mold and then removing the mold to obtain a cured product; and

calcining the cured product in an air atmosphere to obtain a preform composed of ceramic particles, a binder, and pores."

"[0019]

The ceramic particles of the reinforcing material, which can be used, include: oxides such as alumina (Al_2O_3), aluminum borate ($9Al_2O_3 \cdot 2B_2O_3$), silica, and mullite; nitrides, such as silicon nitride, aluminum nitride, titanium nitride, and zirconium nitride; carbides, such as silicon carbide (SiC), boron carbide (B_4C), titanium carbide, and boron carbide; and borides, such as zirconium borate and titanium boride. Among them, preferable are silicon carbide, boron carbide, alumina, and aluminum borate. Silicon carbide has high added value as a mechanical component because of its properties, such as low cost, light weight, high rigidity, low coefficient of thermal

expansion, and high thermal conductivity. Therefore, silicon carbide can be suitably used as a reinforcing material for metal-ceramic composite materials. In addition, boron carbide is lighter than silicon carbide, has high rigidity, and is excellent in impact resistance and neutron absorption. Therefore, boron carbide can be used as a reinforcing material for metal-ceramic composite materials that require such properties. Alumina is suitable as a general-purpose member because it is inexpensive, has high plasma resistance, and has high strength. Further, aluminum borate is extremely excellent in wear resistance, and thus a metal-ceramic composite material using it as a reinforcing material can be used for a sliding member or the like."

"[0034]

Pressurized impregnation is a process of forcibly impregnating the pores of the preform with aluminum or the like melted by pressurization. It is preferable to use aluminum or an aluminum alloy as the metal to be infiltrated into the preform. Specifically, alloys which can be used include commonly used alloys, such as pure aluminum having a purity of 99.0% or more, AC3A and AC8A used for mold castings and sand castings, and ADC12 used for die casting."

No. 5 Comparison / Judgment

1. In this case, Invention 7 will be examined first.

(1) Invention 7 of the present application is "an aluminum alloy-based composite material obtained by the method for producing an aluminum alloy-based composite material according to any one of Claims 1 to 6." Invention 7 of the present application reads as follows in terms of the statement of Claim 1 (hereinafter, referred to as "Invention 7' of the present application").

"An aluminum alloy-based composite material obtained by a method for producing an aluminum alloy-based composite material in which ceramic powder as a reinforcing material is composited in an aluminum alloy,

the method comprising:

a filling step in which the ceramic powder is filled in a porous container made of a porous material, and the porous container is sealed by a lid;

a step of installing in a mold the porous container and pouring a molten aluminum alloy into the mold; and

an impregnation step in which pressure is applied to the molten metal in the mold to impregnate the ceramic powder inside with the molten metal through the porous

container, wherein

ceramic powder as a reinforcing material is uniformly dispersed and distributed in an aluminum alloy matrix,

the ceramic powder is an aluminum borate powder or a mixed powder of aluminum borate powder and silicon carbide, and

the vibration-damping property thereof has faster damping and less noise in the damping waveform, as compared with the vibration-damping property of aluminum."

(2) Invention 7' and Cited Invention are compared. They are common in that they are metal composite materials.

Besides, covering the "wear-resistant material" with a metal-packaging material, placing the material "in a predetermined place in the mold", and "casting the molten metal" in Cited Invention correspond to "installing in a mold" a container filled with "the ceramic powder," and sealing and "pouring a molten" aluminum alloy into the mold in Invention 7'.

Therefore, Invention 7' and Cited Invention have the corresponding features and the Different Features as follows.

(Corresponding Feature)

"a metal composite material obtained by a method for producing a composite material, the method comprising:

a filling step;

a step of pouring a molten metal into the mold; and

an impregnation step of impregnating the molten metal."

(Different Feature 1)

Regarding the metal composite material, Invention 7' defines "a ceramic powder as a reinforcing material is uniformly dispersed and distributed in an aluminum alloy matrix," "the ceramic powder is an aluminum borate powder or a mixed powder of aluminum borate powder and silicon carbide," and "the vibration-damping property thereof has faster damping and less noise in the damping waveform, as compared with the vibration-damping property of aluminum" in Invention 7'. On the other hand, Cited Invention defines "a wear-resistant composite material cast product" in which a molten metal is cast into "a wear-resistant material with excellent wear resistance," but it is silent about "a vibration-damping property."

(Different Feature 2)

Regarding the filling step, in Invention 7' "the ceramic powder is filled in a porous container made of a porous material", whereas Cited Invention features "covering the wear-resistant material with excellent wear resistance with a metal-packaging material that melts with the heat of a molten metal."

(Different Feature 3)

Regarding the impregnation step, Invention 7' features "applying pressure to the molten metal in the mold to impregnate the ceramic powder inside with the molten metal through the porous container," whereas Cited Invention does not make clear whether pressure is applied.

(3) Regarding Different Feature 1

A Invention 7' is an aluminum alloy-based composite material in which a reinforcing material is a uniformly distributed, where the composite material is lightweight and has high Young's modulus, high vibration damping rate, high thermal conductivity, and high wear resistance, and therefore serves as a material for XY tables such as bonding machines, robot arms used in semiconductor manufacturing equipment, chip mounters, scroll parts for air compressors, and the like. (paragraph [0014]).

B By contrast, Cited Invention relates to wear-resistant composite materials used as protective materials or spare parts for worn parts of castings in various industrial machines and construction machines (paragraph [0001]). The metals to be cast are stainless steel, mild steel, and the like (paragraph [0008]). They could not be aluminum or aluminum alloy.

C In addition, Cited Document 2 discloses a metal-ceramic composite material in which aluminum or an aluminum alloy is exemplified as a metal and aluminum borate or silicon carbide is exemplified as a ceramic. It discloses only ceramic preforms. It does not disclose or suggest the physical properties of composite materials such as vibration damping rate.

D Accordingly, the composition of Invention 7' relating to Different Feature 1 is neither described nor suggested in Cited Documents 1 and 2. Besides, it cannot be said to be a well-known art.

As described in the present specification, Invention 7' achieves an effect that a

more excellent vibration-damping property is obtained than that of the conventional aluminum alloy-based composite materials, and the effect is not predictable to a person skilled in the art.

E Without examining Differences 2 and 3, therefore, Invention 7', or Invention 7 of the present application, could not be easily invented by a person skilled in the art based on the inventions disclosed in Cited References 1 and 2.

Differences 2 and 3 are both differences regarding the method for producing "an aluminum alloy-based composite material." As stated in the Appellant's written opinion dated November 14, 2018, it is not possible or is impractical to directly identify the invention of the product, "an aluminum alloy-based composite material," in the present application by the structure or characteristics of the product.

(4) The examiner's reconsideration report states that in Cited Document 1 a person skilled in the art could have easily conceived of using an aluminum alloy as a molten metal used for casting which is a well-known material as disclosed in Cited Document 2, and using aluminum borate as a wear-resistant material as disclosed in Cited Document 2.

However, the content of the report cannot be adopted because, even if the use of an aluminum alloy or aluminum borate is disclosed in Cited Document 2, it was considered in the above (3) that no description or suggestion was made regarding the physical properties of the composite material, such as the vibration damping rate.

2. Regarding Inventions 1 to 6

(1) Cited Invention defines a wear-resistant composite material cast product in its production method. Therefore, comparing Invention 1 of the present application with the production method according to Cited Invention, the two are common in that they are methods for producing metal composite materials.

Then, covering the "wear-resistant material" with a metal-packaging material; placing the material "in a predetermined place in the mold"; and "casting the molten metal" in Cited Invention corresponds to "installing in a mold" a container filled with "the ceramic powder" and sealed and "pouring a molten aluminum alloy into the mold" in Invention 1.

Therefore, Invention 1' and Cited Invention have the corresponding features and the Different Features between Invention 1 and Cited Invention.

(Corresponding Feature)

The feature is that

"a method for producing a composite material, the method comprising:

a filling step;

a step of pouring a molten metal; and

an impregnation step of impregnating the molten metal."

(Different Feature 4)

In Invention 1, a composite material produced is "an aluminum alloy-based composite material" in which "ceramic powder as a reinforcing material" is composed in "an aluminum alloy matrix." On the other hand, In Cited Invention, it is "a wear-resistant composite material cast product" produced by casting a molten metal into "a wear-resistant material with excellent wear resistance."

(Different Feature 5)

Regarding the filling step, Invention 1 features that "the ceramic powder is filled in a porous container made of a porous material, and the porous container is sealed by a lid " whereas Cited Invention features "covering the wear-resistant material with a metal-packaging material that melts with the heat of a molten metal."

(Different Feature 6)

Regarding the impregnation step, Invention 1 features "applying pressure to the molten metal in the mold to impregnate the ceramic powder inside with the molten metal through the porous container," whereas Cited Invention does not make clear whether pressure is applied or not.

(2) In this case, Different Feature 5 will be examined first.

A According to Invention 1, in the subsequent impregnation step, filling a porous container made of a porous material with ceramic powder makes the molten aluminum alloy flow through the porous material of a porous container evenly into the porous container from almost all directions, allowing the entire ceramic powder to be uniformly impregnated (paragraph [0014]).

B By contrast, Cited Invention uses a metal-packaging material that melts with the amount of heat of the molten metal, as described in Cited Document 1, "to allow the amount of heat of the molten metal injected into the mold to melt the metal packaging

material to improve the circulation of the molten metal. Further, the molten metal of the packaging material wraps the wear-resistant material, and the injected molten metal further wraps it, so that the wear-resistant material is surely welded and can be cast with good adhesion." (paragraph [0008]). Therefore, the metal-packaging material in Cited Invention as a production method does not function as a container because it melts into the molten metal.

C Furthermore, Cited Document 2 is to produce a metal-ceramic composite material obtained by impregnating a preform using ceramic particles as a reinforcing material with a base metal. When applying the molten metal, the ceramic particles form a preform without filling the container.

D Then, the constitution of Invention 1 related to the above Different Feature 5 is neither described nor suggested in any of the Cited Documents 1 and 2. Further, the configuration of Invention 1 was not a well-known art before filing the application for the patent.

Then, Invention 1 exerts an effect that a composite material having excellent vibration-damping property as compared with the conventional pressure-casting method by adopting a porous container not disclosed or suggested in Cited Documents 1 and 2, as described in the specification of the present application, and such an effect could not be easily predicted.

E Without examining Differences 4 and 6, therefore, Invention 1 of the present application, could not have been easily invented by a person skilled in the art based on the inventions disclosed in Cited References 1 and 2.

(3) A Each of Inventions 2 to 6 is specified by directly or indirectly referring to Invention 1, and thus includes at least the above Different Features 4 to 6 in comparison with the Cited Invention.

For the same reason as in the above (2), a person skilled in the art could not have easily invented Inventions 2 to 6 based on the inventions disclosed in Cited References 1 and 2.

No. 7 Closing

As stated above, although the reasons for refusal of Examiner's decision and the reasons for refusal of the body have been examined, it cannot be determined that the

present application should be rejected due to these reasons.

In addition, no additional reasons for refusal are found.

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

February 4, 2020

Chief administrative judge: NAKAZAWA, Noboru

Administrative judge: IKEFUCHI, Ryu

Administrative judge: HIRATSUKA, Masahiro