Appeal decision

Appeal No. 2016-13683

Holland
Appellant PHILIPS LIGHTING HOLDING B.V

Tokyo, Japan
Patent Attorney M&S PARTNERS

The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2013-555974, entitled "Circuit Board Assembly" (international publication dated September 7, 2012, International Publication No. WO2012/117345; national publication of the translated version dated June 26, 2014, National Publication of International Patent Application No. 2014-515176, number of claims (15)) has resulted in the following appeal decision.

Conclusion

The examiner's decision is revoked.

The Invention of the present application shall be granted a patent.

Reason

No. 1 History of the procedures

The application was originally filed on February 28, 2012 as an international application (claiming priority under the Paris Convention based on an application received by the foreign receiving office (US) on March 3, 2011), and reasons for refusal were notified on December 1, 2015, a written opinion and a written amendment were submitted on March 7, 2016, and an examiner's decision of refusal was issued on May 2, 2016. Against this, an appeal against the examiner's decision of refusal was requested

and a written amendment was submitted on September 12, 2016.

After that, reasons for refusal (hereinafter, referred to as "the reasons for refusal by the body") were notified by the body on March 23, 2017, and a written opinion and a written amendment were submitted on June 22, 2017.

No. 2 The Invention

The inventions according to Claims 1 to 15 of the present application (hereinafter referred to as "Invention 1" to Invention 15," respectively) are specified by the matters described in Claims 1 to 15 according to the scope of claims for patent amended by the written amendment submitted on June 22, 2017; and among them Invention 1 is as follows, as specified by the matters described in Claim 1 thereof.

"[Claim 1]
A circuit board assembly, comprising:

a core layer;

at least one conductive layer arranged on a first side of said core layer;

a plurality of connection pads in electrical connectivity with said at least one conductive layer;

a dielectric bottom layer arranged on a second side opposite said first side of said core layer;

an outer dielectric layer directly atop an outermost of said at least one conductive layer, which includes a plurality of openings, each of said openings providing electrical access to one of said connection pads, which is substantially exposed and is substantially continuous except for said openings, and which provides flame-retardant, fire enclosure, and/or shock-preventive characteristics; and

a plurality of LEDs, each of which is electrically connected to one of said connection pads, and substantially covers said connection pad by the die base of each of said LEDs when electrically connected to said connection pad; wherein

said core layer, said conductive layer, said dielectric bottom layer, and said outer dielectric layer form a circuit board; and said core layer and conductive layer, said core

layer and dielectric bottom layer, and said conductive layer and outer dielectric layer are bonded with each other directly or via another layer."

Inventions 2 to 15 further limit Invention 1.

No. 3 Cited Document, etc.

1 Regarding Cited Document 1

(1) Cited Document 1 (International Publication No. WO2010/143829) which is cited in the reasons for refusal of the examiner's decision includes the following description with drawings.

A "[19] FIG. 1 is a conceptual perspective view showing separate layers of the LED array board embodying the present invention.

[20] FIG. 2 is a schematic assembly perspective view of the LED array board in Figure 1."

B "Mode for the Invention

[27] Hereinafter, the present invention is described in detail by examples and the accompanying drawings.

[28] Example 1

[29] An aluminum plate l (305 mm X 255 mm X l mm) is immersed in degreaser SZ-9 manufactured by Jinyoung Chemical consisting of NaOH, NaHCCβ, Na_2CO_3, surfactant, and water and is degreased for 15 minutes at 50~60°C. The degreased aluminum plate 1 is washed, immersed in NaOH aqua solution of 10 g/L concentration at about 60°C for 3 minutes, and then washed with water. The aluminum plate 1 is immersed into 10% sulfuric acid aqua solution at room temperature, and by applying positive voltage to the aluminum plate 1 at a current density of 0.5 A/dm^2 for 60 minutes, alumina layers 2, 6 are obtained on the front face and on the rear face of the aluminum plate 1, with thicknesses of 33.2 and 31.7μm, respectively.

[30] 650 g of silver platelet powder having an average particle size of 1.97 μm, 240 g of

an epoxy binder which is prepared by diluting epoxy resin of KER 1009 manufactured by Keumho P&B in normal terpineol to attain 50 weight% concentration, and a residual amount of Butyl Cellosolve<R> (brand name of 2-butoxyethanol) are thoroughly mixed together to yield 1 Kg of silver paste. The silver paste composition was printed as an electrode circuit 3 on the alumina layer 2 of the aluminum plate. Then, the aluminum plate is heat-treated at 190°C for 12 minutes so that the adhesion force, the hardness, and the surface electric resistance of the electrode circuit are respectively 5B, 5H and $8.6X10^{-5}$ Ω· cm.

[31] For sealing, the aluminum plate with electric circuit printed on is immersed in nickel acetate aqua solution in concentration of 2g/L for 5 minutes, and then is treated in distilled water at 95°C for 10 minutes. The withstanding insulation voltage between the front and the rear face of the sealed aluminum plate is measured by CHROMA AC/ DC/IR HIPOT TESTER model 19052 to be 2.71 Kv/mm.

[32] The aluminum plate is printed by screen printer with SCR-1000W, thermoset resinous solder-resist, manufactured by Seoul Chemistry Research Center to form a protective insulating layer 5 on the electrode circuit, and then is heat-treated at 150°C for 50 minutes.

[33] The electrical contacts 12 are coated with solder cream. LED packages of 1608 type 11 made by Seoul Semi-Conductor are located in array on the exposed electrical contacts 12 of the finished LED array board 10 and are soldered by reflow process.

[34] Example 2

[35] An aluminum plate l (305 mm X 255 mm X l mm) is immersed in degreaser SZ-9 manufactured by Jinyoung Chemical consisting of NaOH, NaHCCβ, Na_2CO_3, surfactant, and water and is degreased for 15 minutes at 50~60°C. The degreased aluminum plate 1 is washed, immersed in NaOH aqua solution of 10 g/L concentration at about 60°C for 3 minutes, and then washed with water. The aluminum plate 1 is immersed in an aqua solution of 50 g oxalic acid, 10 g boric acid, 3 g lactic acid, and 1 g magnesium sulfate in 1 liter of water at room temperature, and by applying plus voltage to the aluminum plate 1 at a current density of 0.5 A/dm^2 for 60 minutes, alumina layers 2, 6 are obtained on the front face and on the rear face of the aluminum

plate 1 with thickness of 33.6 and 32.5μm respectively.

[36] 650 g of silver platelet powder having an average particle size of 1.97 μm, 240 g of an epoxy binder which is prepared by diluting epoxy resin of KER1009 manufactured by Keumho P&B in normal terpineol to be of 50 weight% concentration and a residual amount of Butyl Cellosolve (brand name of 2-butoxyethanol) are thoroughly mixed together to yield 1 Kg of silver paste. The silver paste composition was printed as an electrode circuit 3 on the alumina layer 2 of the aluminum plate. Then, the aluminum plate is heat-treated at 190°C for 12 minutes so that adhesion force, hardness, and surface electric resistance of the electric circuit are respectively 5B, 5H and $8.4X10^{-5}$ Ω · cm.

[37] For sealing, the aluminum plate with electric circuit printed on is immersed in a nickel fluoride aqua solution in concentration of 5g/L for 20 minutes, and then is treated in nickel acetate aqua solution at 90°C for 20 minutes. The withstanding insulation voltage between the front and the rear face of the sealed aluminum plate is measured by CHROMA AC/DC/IR HIPOT TESTER model 19052 to be 2.66 Kv/mm. The heat conductivity through the board at an electrical contact was 56.49 W/m· k. The heat conductivity for the board of the present invention is superior to that of general MCPCB which is below 2.0W/m· k.

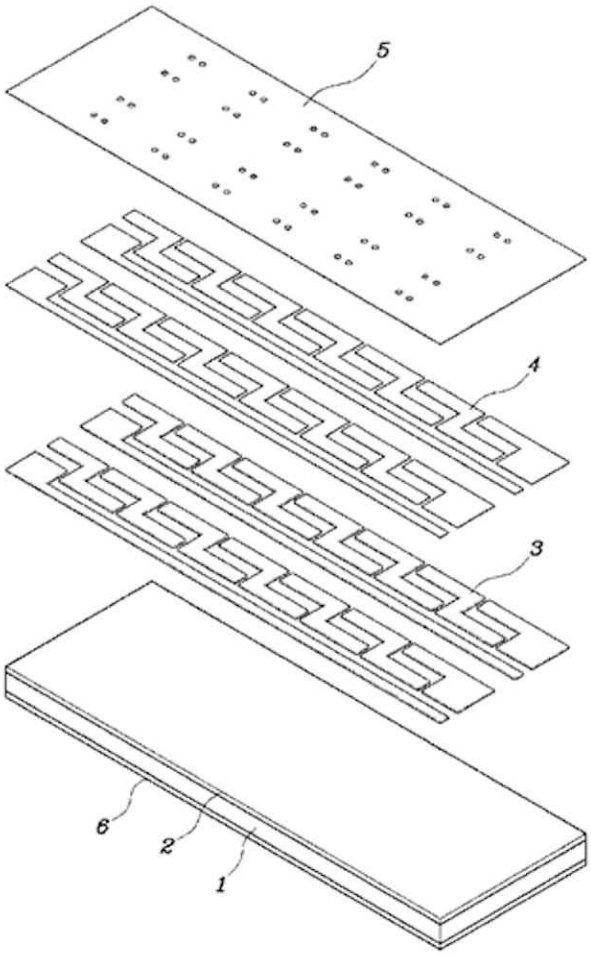
[38] The sealed aluminum plate is immersed in a plating bath of 220g copper sulfate, 63g sulfate, 10 ppm chlorine and, as rust inhibitor, 10 g 5007-MU, 0.5 g 5000-A and 0.5 g 5007-B made by IBC in l liter of water and is applied by current of 5 A/dm^2 for 30 minutes, and thus a copper plated layer 4 of 3/M thick having a surface electric resistance of $5X10^{-6}$ Ω· cm is obtained.

[39] The aluminum plate is printed by a screen printer with SCR-1000W, thermoset resinous solder-resist, manufactured by Seoul Chemistry Research Center to form a protective insulating layer 5 on the electrode circuit, and then is heat-treated at 150°C for 50 minutes.

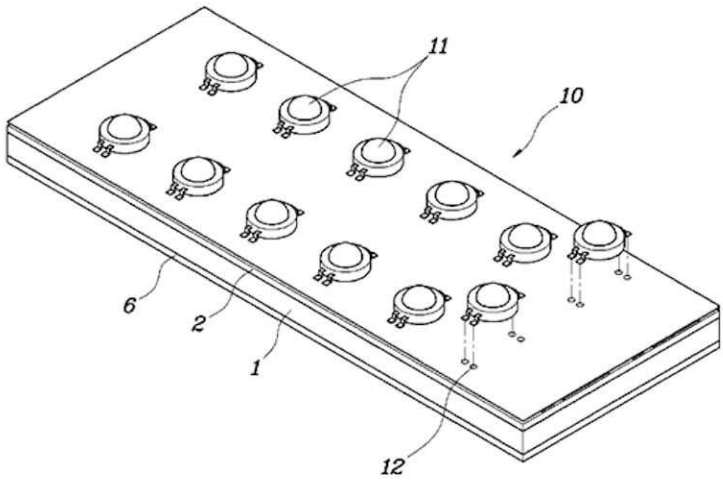
[40] The electrical contacts 12 are coated with solder cream. LED packages of 1608 type 11 made by Seoul Semi-Conductor are located in array on the exposed electrical contacts 12 of the finished LED array board 10 and are soldered by reflow process. The

adhesion strength is measured to be 2.67 Kgf."

[Fig. 1]



[Fig. 2]



(2) Accordingly, the above Cited Document 1 describes the following invention (hereinafter, referred to as "the Cited Invention") as Example 2.

"An LED array board 10 comprising:

an aluminum plate 1 on the front face and rear face of which alumina layers 2 and 6 are formed;

an electrode circuit 3 that is formed by printing a silver paste composition on the alumina layer 2 on the aluminum plate;

a copper plated layer 4 that is formed on the electrode circuit 3 on the aluminum plate;

a protective insulating layer 5 on the electrode circuit that is formed by printing a thermoset resinous solder-resist on the aluminum plate and then performing heat treatment; and

LED packages 11 that are arranged in an array on the exposed electrical contacts 12 of the finished LED array board 10 and are soldered."

2 Regarding Cited Document 2

In addition, Cited Document 2 (Japanese Unexamined Patent Application Publication No. 2008-53362), which is cited in the reasons for refusal of the examiner's decision, includes the following description with drawings.

"[Background art]

[0002]

Recently, for a printed circuit board, a substrate with good heat dissipation has been required with the increased density of electronic components. As a printed circuit board having excellent heat dissipation, a metal core substrate is known and has already been put to practical use. The metal core substrate disperses heat from a heat generating component throughout the substrate by using metals such as aluminum and copper having high thermal conductivity as a core material, enabling the suppression of a temperature rise of the heat generating component. Among them, relatively light aluminum whose thermal conductivity is 236 W/m· K and density is 2.7 g/cm^3 is

generally used as the core material (for example, see Patent Document 1).

[0003]

In addition, carbon fiber reinforced plastics (hereinafter abbreviated as CFRP) are also being considered as a core material having lower thermal expansion, higher strength, and lighter weight than aluminum (for example, see Patent Document 2).

[0004]

Generally, carbon fibers having a thermal conductivity of 140 to 800· W/m K are commercially available. A CFRP plate, which is obtained by laminating a prepreg comprising carbon fibers (unidirectional material) having a thermal conductivity of 620 W/m· K at 0° / 90° / 90° / 0°, has a thermal expansion coefficient (plane) of about 0 ppm/°C., a thermal conductivity of 217 W/m· K, an elastic modulus of 290 GPa, and a density of 1.6 g/cm^3 and can be provided as a core material that has lower thermal expansion, higher strength, and lighter weight than aluminum, while having a heat radiation of the same level as aluminum. Therefore, when the core substrate is manufactured using this CFRP, there can be obtained a substrate which does not generate cracks in the solder connection portion even when large ceramic parts are mounted, provides higher performance than aluminum, and is excellent especially in mounting reliability."

3 Regarding Cited Document 3

In addition, Cited Document 3 (National Publication of International Patent Application No. 2000-503259) which is cited in the reasons for refusal of the examiner's decision, includes the following description with drawings.

"Referring to FIG. 1 of the invention, a laminated substrate 1 is continuously or sequentially constructed by laminating alternating layers of conductive and dielectric layers. Various layers are positioned in the form of a stack, and then are pressed to fit in a state where the dielectric material is in the b stage of curing generally so as not to fully cure each of the layers until after the pressing." (Page 21, lines 21-24)

4 Regarding Cited Document 4

In addition, Cited Document 4 (Japanese Unexamined Patent Application Publication No. 2006-339639), which is cited in the reasons for refusal of the examiner's decision, includes the following description with drawings.

"[0086]

FIGS. 7a and 7b are perspective views illustrating the high power LED package according to a second embodiment of the present invention, and FIG. 8 is a longitudinal sectional view illustrating the high power LED package according to the second embodiment of the present invention.

[0087]

The constituent parts of the LED package 100a according to the present invention, which are the same as those of the LED package of the first embodiment, are denoted with the same reference numerals with the detailed explanations thereof omitted.

[0088]

The heat conducting member 120a with the light emitting part 110 mounted thereon is composed of the upper and lower metal layers 121a and 122a. The lead part 130a includes the first lead 133' extended from the lower metal layer 122a, and the second lead 136' completely separated from the heat conducting member 120a and connected with the light emitting part 110 via wires 115.

[0089]

Here, the first and second leads 133' and 136' are exposed through the floor surface and the outer surface of the mold part 140a which is injection-molded to integrally fix the heat conducting member 120a and the lead part 130a."

No. 4 Judgment by the body

1 Regarding Invention 1

(1) Comparison

Invention 1 and the Cited Invention are compared.

A. An aluminum plate 1, an electrode circuit 3 and a copper plated layer 4, electrical contacts 12, an alumina layer 6, a protective insulating layer 5, LED packages 11, and a LED array board 10 in the Cited Invention correspond to a core layer, conductive layers,

connection pads, a dielectric bottom layer, an outer dielectric layer, LEDs, and a circuit board assembly in the Invention, respectively.

B. In addition, the "upper" side in the Cited Invention corresponds to the first side in the Invention.

C. In addition, the "LED array board 10" in the Cited Invention includes "a copper plated layer 4 that is formed on the electrode circuit 3 on the aluminum plate" and "LED packages 11 that are arranged in array on the exposed electrical contacts 12 of the finished LED array board 10 and are soldered," and therefore, it is obvious that the electrical contacts 12 are ones for electrical connection with the electrode circuit 3 and the copper plated layer 4.

D. Referring to FIGS. 1 and 2 in the Cited Document 1, it is obvious that the protective insulating layer 5 is substantially exposed and is substantially continuous in the Cited Invention.

E. The Cited Invention includes "LED packages 11 that are arranged in an array on the exposed electrical contacts 12 of the finished LED array board 10 and are soldered," and therefore, Invention 1 and the Cited Invention are identical in terms of including "a plurality of LEDs, each of which is electrically connected to one of said connection pads."

Therefore, the corresponding features and different features between Invention 1 and the Cited Invention are as follows:

<The corresponding features>

"A circuit board assembly, comprising:

a core layer;

at least one conductive layer arranged on a first side of said core layer;

a plurality of connection pads in electrical connectivity with said at least one conductive layer;

a dielectric bottom layer arranged on a second side opposite the first side of said core layer;

an outer dielectric layer which is directly atop the outermost of said at least one conductive layer and is substantially exposed and substantially continuous; and

a plurality of LEDs each of which is electrically connected to one of said connection pads."

<The different features>

<Different feature 1>

As for the outer dielectric layer, in Invention 1, it "includes a plurality of openings, each of said openings providing electrical access to one of said connection pads," "is substantially continuous except for said openings," and "provides flame-retardant, fire enclosure, and/or shock-preventive characteristics"; whereas, as for the protective insulating layer 5, in the Cited invention, it is not specified that a plurality of openings are included (hereinafter, referred to as "the different feature 1-1"), and in addition, it is not specified that it "provides flame-retardant, fire enclosure, and/or shock-preventive characteristics" (hereinafter, referred to as "the different feature 1-2").

<The different feature 2>

As for the LED, in Invention 1, it "substantially covers said connection pad by the die base of each of the said LEDs when electrically connected to said connection pad"; whereas, in the Cited Invention, the LED package 11 does not cover the electrical contacts 12 when connected to the electrical contacts 12.

<The different feature 3>

In Invention 1 "said core layer, said conductive layer, said dielectric bottom layer, and said outer dielectric layer form a circuit board; and said core layer and conductive layer, said core layer and dielectric bottom layer, and said conductive layer and outer dielectric layer are bonded with each other directly or via another layer"; whereas, in the Cited Invention, such a configuration is not specified for the aluminum plate 1 (core layer), the electrode circuit 3 and copper plated layer 4 (conductive layer), the alumina layer 6, and the protective insulating layer 5.

(2) Judgment on the different features

First, the different feature 1-2 is examined.

The Cited Document 1 does not provide specific descriptions on the grade of flame-retardancy and the degree of shock-preventive characteristics with respect to the protective insulating layer 5.

In addition, the protective insulating layer 5 in the Cited Invention "is formed by printing a thermoset resinous solder-resist and then performing heat treatment" and therefore it is specified that the layer comprises the "thermoset resin"; whereas, the Cited Invention does not provide a specific description on materials, etc. of the thermoset resin and such a description cannot be found that can be a clue for considering the protective insulating layer 5 as one that provides flame-retardant, fire enclosure, or shock-preventive characteristics.

Therefore, in the Cited Invention, it cannot be said that a person skilled in the art could easily adopt the configuration of the Invention 1 relating to the different feature 1-2.

Further, in the Cited Documents 2 to 4, it is neither described nor suggested that '"an outer dielectric layer directly atop an outermost of said at least one conductive layer," "which provides flame-retardant, fire enclosure, and/or shock-preventive characteristics"' in Invention 1 is included.

Therefore, it cannot be said that even when referring to the Cited Documents 2 to 4, a person skilled in the art could easily adopt the configuration of Invention 1 relating to the difference feature 1 in the Cited Invention.

Thus, Invention 1 could not have been easily made by a person skilled in the art, on the basis of the Cited Invention 1 and the technical matters described in the Cited Documents 2 to 4 without examining the different features 1-1, 2 and 3.

2 Regarding Inventions 2 to 15

Inventions 2 to 15 further limit Invention 1 and are provided with the configuration of "an outer dielectric layer ... which provides flame-retardant, fire enclosure, and/or shock-preventive characteristics"; and therefore, for a reason similar to that for Invention 1, Inventions 2 to 15 could not have been easily made by a person skilled in the art, on the basis of the Cited Invention and the technical matters described in the Cited Documents 2 to 4.

No. 5 Outline of the examiner's decision and judgment on the examiner's decision

The examiner's decision is such that the inventions according to Claims 1 to 15 could have been easily made by a person skilled in the art on the basis of the inventions described in the above Cited Documents 1 to 4 and thus, the appellant should not be granted a patent for the inventions in accordance with the provisions of Article 29(2) of the Patent Act, and in addition, the description of Claim 7 is not clear and does not meet the requirement stipulated in Article 36(ii) of the Patent Act.

However, as described above, Inventions 1 to 15 could not have been easily made by a person skilled in the art on the basis of the invention described in the above Cited Document 1 and the technical matters described in the above Cited Documents 2 to 4.

In addition, in Claim 7 which has been amended by the written amendment dated September 12, 2016, the descriptions of "fire resistive rated" and "non-flame retardant" have been deleted, resolving the above imperfection in the description of Claim 7.

Therefore, the examiner's decision cannot be maintained.

No. 6 Reasons for refusal by the body

1. Regarding Article 36(6) (i) of the Patent Act

The body issued a notice of the reason for refusal (Reason 1 (support requirement)) that means for solving the problem which was described in the detailed description of the inventions was not reflected on the inventions according to Claim 1

and Claims 2 to 15, citing Claim 1 which had been amended on September 12, 2016, and that a patent was sought by exceeding a scope described in the detailed description of the inventions and therefore, the inventions according to Claim 1, and Claims 2 to 15 citing Claim 1 were not ones which were described in the detailed description of the inventions.

However, this reason for refusal has been resolved as a result of the amendment dated June 22, 2017 to "an outer dielectric layer ... which provides flame-retardant, fire enclosure, and/or shock-preventive characteristics."

2. Regarding Article 36(6) (ii) of the Patent Act

(1) The body issued a notice of the reason for refusal (Reason 2 (clarity)) that the description in Claim 1, which had been amended on September 12, 2016, "said core layer, said top conductive layer, said dielectric bottom layer, and said outer dielectric layer cohesively bonded together and forming a cohesive circuit board" is not clear.

However, this reason for refusal has been resolved as a result of the amendment dated June 22, 2017 to "said core layer, said conductive layer, said dielectric bottom layer, and said outer dielectric layer form a circuit board; and said core layer and conductive layer, said core layer and dielectric bottom layer, and said conductive layer and outer dielectric layer are bonded with each other directly or via another layer."

(2) The descriptions of "said core layer, said top conductive layer, said bottom conductive layer, and said outer dielectric layer cohesively bonded together and forming a cohesive circuit board" in Claim 1, "said connection pads are cohesively integrally formed with said conductive layer" in Claim 8, and "said core layer, said conductive layer, and said bottom conductive layer are cohesively bonded together" in Claim 9 which have been amended on September 12, 2016 have a probability of corresponding to the case where there is description with manufacturing technical characteristics and conditions; and therefore, it can be said that those claims include the description of a manufacturing method of the product. However, there is no description about the impossible/impractical circumstances in the specification of the Invention, and it cannot

be said that the impossible/impractical circumstances are obvious to a person skilled in the art. Therefore, the body issued a notice of the reason for refusal (Reason 2 (Clarity)) that the inventions according to Claims 1, 8, and 9, and Claims 2 to 7 and 10 to 15 citing Claims 1 and 9 are not clear.

However, this reason for refusal has been resolved as a result of the amendment dated June 22, 2017, in which the description in Claim 1 was amended to "said core layer, said conductive layer, said dielectric bottom layer, and said outer dielectric layer form a circuit board," the description in Claim 8 was amended to "said connection pads are integrally cohesive with said conductive layer," and the description in Claim 9 was amended to "said core layer and conductive layer, and said core layer and dielectric bottom layer are bonded with each other directly or via another layer."

(3) The body issued a notice of the reason for refusal (Reason 2 (clarity)) that the description in Claim 15, which had been amended on September 12, 2016, "said top conductive layer" is not clear.

However, this reason for refusal has been resolved as a result of the amendment dated June 22, 2017 to "said conductive layer."

No. 7 Closing

As described above, Inventions 1 to 15 could not have been easily made by a person skilled in the art on the basis of the Cited Invention and the technical matters described in the Cited Documents 2 to 4.

Therefore, the application cannot be rejected due to the reasons of the examiner's decision.

In addition, no additional reasons for refusal were found.

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

September 15, 2017

Chief administrative judge: MORI, Ryosuke

Administrative judge: ONDA, Haruka

Administrative judge: KONDO, Yukihiro