

## **Appeal decision**

Appeal No. 2014-018824

Tokyo, Japan

Appellant

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Patent Attorney

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The case of appeal against the examiner's decision of refusal regarding Japanese Patent Application No. 2011-519816, entitled "Method for treating wastewater containing ammonia nitrogen", whose International Publication WO 2010/150691 was published on December 29, 2010, has resulted in the following conclusion:

### **Conclusion**

The appeal of the case was groundless.

### **Reason**

#### **No. 1 History of the procedures**

The application was filed on June 16, 2010 (domestic priority claim: June 22, 2009) as an International Patent Application, the written amendment was submitted on June 28, 2012, a notice of reasons for refusal was issued on December 19, 2013, a written opinion and a written amendment were submitted on March 4, 2014, an examiner's decision for refusal was issued on June 19, 2014, an appeal against the decision of refusal was made on September 19, 2014 and a written amendment was submitted at the same time, and a written statement was submitted on January 19, 2015.

#### **No. 2 Decision to dismiss the amendment dated September 19, 2014**

##### **[Conclusion of Decision to Dismiss Amendment]**

The amendment dated September 19, 2014 (hereinafter referred to as "The Amendment") shall be dismissed.

##### **[Reasons]**

## 1. Regarding the Amendment

(1) The Amendment is to modify Claim 1 as follows.

(Before the Amendment)

"[(OLD) Claim 1]

A method for treating wastewater containing ammonia nitrogen by using a wastewater treatment apparatus, wherein the wastewater treatment apparatus comprises a nitrification tank, comprising:

performing an entire nitrification reaction to convert ammonia nitrogen to nitrate nitrogen via nitrite nitrogen in the nitrification tank,

wherein the nitrification reaction is promoted by allowing nitrifying bacteria to perform the nitrification reaction in the presence of an intermicrobial signaling molecule, which increases the rate of the nitrification reaction, and

wherein the intermicrobial signaling molecule is at least one or more compounds selected from the group consisting of C4-homoserine lactone, C8-homoserine lactone, C10-homoserine lactone, C12-homoserine lactone, C14-homoserine lactone, 3-oxo-C6-homoserine lactone, and 3-oxo-C12-homoserine lactone."

(After the Amendment)

"[(NEW) Claim 1]

A method for treating wastewater containing ammonia nitrogen by using a wastewater treatment apparatus, wherein the wastewater treatment apparatus comprises a nitrification tank, comprising:

performing an entire nitrification reaction to convert ammonia nitrogen to nitrate nitrogen via nitrite nitrogen in the nitrification tank,

wherein the nitrification reaction is promoted by allowing nitrifying bacteria to perform the nitrification reaction in the presence of an intermicrobial signaling molecule, which increases the rate of the nitrification reaction, and

wherein the intermicrobial signaling molecule is at least one or more compounds selected from the group consisting of C8-homoserine lactone, C10-homoserine lactone, C12-homoserine lactone, C14-homoserine lactone, 3-oxo-C6-homoserine lactone, and 3-oxo-C12-homoserine lactone."

The amendment regarding Claim 1 is to delete "C4-homoserine lactone" among choices of intermicrobial signaling molecules which are the matters specifying the invention of OLD Claim 1 and the inventions according to Claim 1 before and after the

Amendment are identical regarding the field of industrial application and the problems to be solved. Therefore, it can be said that the purpose of the Amendment corresponds to restriction of the scope of claims as prescribed in Article 17-2(5)(ii) of the Patent Act, and the amendment is not to add new matters.

Thus, it will be examined below whether the invention according to NEW Claim 1 is independently patentable at the time when the patent application was filed (or whether the invention falls under the provisions of Article 126(7) of the Patent Act which is applied mutatis mutandis pursuant to the provisions of Article 17-2(6) of the Patent Act).

## 2. Judgment on requirements for being independently patentable

### 2-1. Regarding Amended Invention

The above invention according to NEW Claim 1 (hereinafter referred to as the "Amended Invention") is specified by the matters described in NEW Claim 1 as mentioned above.

### 2.2. Invention described in the Cited Document

#### (1) Descriptions in the Cited Document

National Publication of International Patent Application No. 2005-505419 (hereinafter referred to as the "Cited Document 1"), which was also cited as Cited Document 1 in the reasons for refusal of the examiner's decision and was distributed before the priority date of the application, contains the following descriptions relating to "Organic waste treatment" (Title of the Invention).

#### (A) "[Claim 1]

A method of treatment of sewage comprising:  
adding at least one cell signaling chemical (CSC) to a sewage substrate,  
wherein the at least one CSC regulates activity in at least one microbial population in the sewage substrate."

#### (B) "[Claim 11]

A method according to claim 1 wherein the microbial population is selected from the group consisting of sulfur-reducing bacteria, sulfate-producing bacteria, ammonia-producing bacteria, nitrite-producing bacteria, nitrate-producing bacteria and methane-producing bacteria."

#### (C) "[Claim 48]

A method of controlling bacteria responsible for oxidation or reduction of

nitrogenous compounds in a sewage substrate comprising:

adding at least one cell signaling chemical (CSC) to the sewage substrate,  
wherein the at least one CSC regulates the activity of ammonia-producing bacteria, nitrite-producing bacteria, nitrous oxide-producing bacteria, nitrate-producing bacteria, or denitrifying bacteria.

[Claim 49]

A method according to claim 48 wherein the at least one CSC is selected from the group consisting of halogenated furanones, hydroxylated furanones, alkyl furanones, N-acyl homoserine lactones, peptide pheromones, and mixtures thereof."

(D) "[0017]

As used herein, the term "up regulate" refers to the use of at least one CSC at sufficient signal strength to cause a rapid increase in microbial activity of at least one species of microbe (an increase in either or both of the metabolic and reproduction rate of bacteria), the coordination of individual microbial functioning resulting in the possible formation of an attachment layer on surfaces, the possible formation of microcolonies, possible quorum sensing, and the formation of mature biofilms."

(E) "[0037]

In another aspect, the concentration of the at least one CSC (signal strength) will be a critical factor in the activation of specific receptor proteins that will initiate specific gene expression.

Sewage includes both carbonaceous and nitrogenous wastes. Carbonaceous waste includes compounds containing carbon and hydrogen atoms and may include other atoms, such as oxygen, nitrogen, sulfur, and phosphorus. Nitrogenous waste includes compounds containing nitrogen atoms and other atoms such as hydrogen, carbon, and oxygen. Nitrogenous waste includes urea, uric acid, ammonia, nitrates, and nitrites. Sewage includes populations of many different microbes, including aerobes, facultative anaerobes, and anaerobes."

(F) "[0046]

In a preferred aspect of the invention there is provided a method of treatment of a sewage comprising:

adding at least one cell signaling chemical (CSC) to a sewage, wherein the at least one CSC enhances the activity of aerobic, anaerobic, or facultative anaerobic microbial populations in the sewage.

[0047]

This aspect of the invention is particularly useful in up regulating the microbial activity and hence increasing the rate of sewage decomposition in sewage treatment

plants. ..."

(G) "[0058]

In yet another preferred aspect of the invention there is provided a method of enhancing microbial digestion of sewage at a sewage treatment plant comprising:

adding at least one cell signaling chemical to a sewage substrate at the sewage treatment plant or in the sewerage catchment network,

wherein the at least one cell signaling chemical enhances the activity of aerobic and facultative anaerobic bacteria.

[0059]

This aspect of the invention is particularly useful in treating sewage as it arrives at the sewage treatment plant. Advantageously, an increase in aerobic and facultative anaerobic activity, reproduction, and/or metabolic rates aids microbial digestion of the sewage, which improves the sewage effluent quality and reduces sludge volumes. Particularly useful in this aspect of the invention are AHLs, pheromone peptides, N-acylated, C-amidated D-amino acid hexapeptides, D-amino acids comprising D-isoleucine and/or D-tyrosine, cyclic dipeptides, hydrophobic tryamines, lipopeptide biosurfactants, fatty acid derivatives, antimicrobial peptides, and furanones. Especially preferred CSCs are AHLs."

(H) "[0061]

In yet another preferred aspect of the invention there is provided a method of controlling the bacteria responsible for the oxidation or reduction of nitrogenous compounds in a sewage substrate comprising:

adding at least one cell signaling chemical (CSC) to the sewage substrate,

wherein the at least one CSC regulates the activity of ammonia-producing bacteria, nitrite-producing bacteria, nitrate-producing bacteria or denitrifying bacteria.

Specific CSCs or combinations of CSCs and/or specific CSC signal strengths can be used to up or down regulate the bacteria responsible for the ammonification, nitrification, and denitrification of sewage. This aspect of the invention is particularly useful in controlling a range of environmental pollutants, both airborne and waterborne. N-acyl homoserine lactones such as 3-oxo-decanoyl homoserine lactone and butyryl homoserine lactone or mixtures thereof are particularly useful in up regulation, while halogenated furanones, hydroxylated furanones, and alkyl furanones are particularly useful in the down regulation of this aspect of the invention."

## (2) Invention disclosed in the Cited Document

According to the descriptions (A) (B) (E), the Cited Document 1 discloses an

invention relating to a method of treatment of sewage including nitrogenous waste, wherein the nitrogenous waste of sewage includes urea, uric acid, ammonia, nitrates, and nitrites.

According to the descriptions (F) (G), the Cited Document 1 discloses that when cell-signaling chemicals are added, the microbial activity of aerobes or anaerobes is upregulated and enhanced and the rate of sewage decomposition in a sewage treatment plant increases.

According to the descriptions (C) (H), the Cited Document 1 discloses that adding N-acyl homoserine lactone or a mixture thereof as a cell-signaling chemical to a sewage substrate can upregulate the activity of bacteria responsible for the ammonification, nitrification, and denitrification of sewage.

Therefore, the Cited Document 1 discloses  
"A method of treatment of sewage including nitrogenous waste including urea, uric acid, ammonia, nitrates, and nitrites by using a sewage treatment plant, comprising:  
adding a cell-signaling chemical to upregulate the microbial activity of bacteria responsible for the ammonification, nitrification, and denitrification of sewage and increase the rate of sewage decomposition,  
wherein the cell signaling chemical is N-acyl homoserine lactone or a mixture thereof."  
(Hereinafter referred to as "Cited Invention 1.")

## 2-3. Comparison / Judgment

### (1) Comparison

The Amended Invention and the Cited Invention 1 are compared.

A "sewage treatment plant" of the Cited Invention 1 corresponds to a "wastewater treatment apparatus" of the Amended Invention, "ammonia" corresponds to "ammonia nitrogen," a "cell-signaling chemical" corresponds to an "intermicrobial signaling molecule," "bacteria responsible for nitrification" corresponds to "nitrifying bacteria," and a "method of treatment of sewage including nitrogenous waste including urea, uric acid, ammonia, nitrates, and nitrites" corresponds to a "method for treating wastewater containing ammonia nitrogen."

According to the description (H), in the Cited Invention 1, "sewage including nitrogenous waste including urea, uric acid, ammonia, nitrates, and nitrites" is decomposed by "bacteria responsible for the ammonification, nitrification, and denitrification of sewage," wherein the microbial activity is upregulated by adding a cell-signaling chemical.

Further, according to the description (D), upregulation of the microbial activity means the rapid increase in either or both of the metabolic and reproduction rate of microbe. According to the description (F), since the rate of sewage decomposition goes up by adding a cell-signaling chemical to upregulate the microbial activity, it can be said in the Cited Invention 1 that the cell-signaling chemical added in sewage increases the rate of ammonification, nitrification, and denitrification by rapidly increasing either or both of the metabolic and reproduction rate of "bacteria responsible for the ammonification, nitrification, and denitrification of sewage."

Therefore, the Amended Invention and the Cited Invention 1 are identical in that each one is

"A method for treating wastewater containing ammonia nitrogen by using a wastewater treatment apparatus comprising:

performing a nitrification reaction,

wherein the nitrification reaction is performed by nitrifying bacteria in the presence of an intermicrobial signaling molecule, which increases the rate of the nitrification reaction,

wherein the intermicrobial signaling molecule is N-acyl homoserine lactone",

and they differ in the following points.

(Difference 1)

Nitrification reaction of the Amended Invention is to convert ammonia nitrogen to nitrate nitrogen via nitrite nitrogen while that of the Cited Invention 1 is not clear.

(Difference 2)

A wastewater treatment apparatus of the Amended Invention includes a nitrification tank, and an entire nitrification reaction to convert ammonia nitrogen to nitrate nitrogen via nitrite nitrogen is performed in the nitrification tank while it is unclear whether a sewage treatment plant of the Cited Invention 1 includes a nitrification tank and whether nitrification reaction is performed in the nitrification tank.

(Difference 3)

An intermicrobial signaling molecule of the Amended Invention is at least one or more compounds selected from the group consisting of C8-homoserine lactone, C10-homoserine lactone, C12-homoserine lactone, C14-homoserine lactone, 3-oxo-C6-homoserine lactone, and 3-oxo-C12-homoserine lactone while a cell-signaling chemical of the Cited Invention 1 is N-acyl homoserine lactone or a mixture thereof.

## (2) Judgment

### Regarding Difference 1 and Difference 2

As described in, for example, "Technology and Apparatus for Preventing Water Pollution, 4. Technology and Apparatus for biological water treatment ", first edition, edited by Incorporated Organization of Chemical Engineers, issued by BAIFUKAN CO., LTD, October 20, 1978, Page 205, Line 19 to Page 207 Line 1 and FIG. 6•1 (printed below), it can be said that wastewater treatment using a biological denitrification process in a wastewater treatment apparatus is performed by a nitrification step of nitrifying in a nitrification tank,  $\text{NH}_3\text{-N}$  in waste water and  $\text{NH}_3\text{-N}$  converted from organic nitrogen, and a denitrification step which is performed after the nitrification step. In the nitrification step, nitrification reaction is performed in the nitrification tank, and the nitrification reaction is the reaction in which  $\text{NH}_3\text{-N}$  in waste water or  $\text{NH}_3\text{-N}$  converted from organic nitrogen is converted to  $\text{NO}_2\text{-N}$  by nitrite bacteria, and then  $\text{NO}_2\text{-N}$  is converted to  $\text{NO}_3\text{-N}$  by nitrate bacteria.

Since " $\text{NH}_3$ ," " $\text{NO}_2$ ," and " $\text{NO}_3$ " are respectively a chemical formula representing "ammonia," "nitrous acid," and "nitric acid," the above nitrification reaction is the reaction in which ammonia nitrogen in waste water or ammonia nitrogen converted from organic nitrogen is converted to nitrite nitrogen by nitrite bacteria, and then nitrite nitrogen is converted to nitrate nitrogen by nitrate bacteria.

Further, according to the description (H) in the Cited Document 1, since denitrification is performed by using bacteria responsible for the ammonification, nitrification, and denitrification of sewage in a sewage treatment plant corresponding to a wastewater treatment apparatus, it is also recognized in the Cited Invention 1 that treatment of wastewater by using the above biological denitrification process is performed.

Therefore, Difference 1 and Difference 2 are not substantial since it can also be said in the Cited Invention 1 that ammonia included in sewage is converted to nitrate nitrogen via nitrite nitrogen in a nitrification tank.



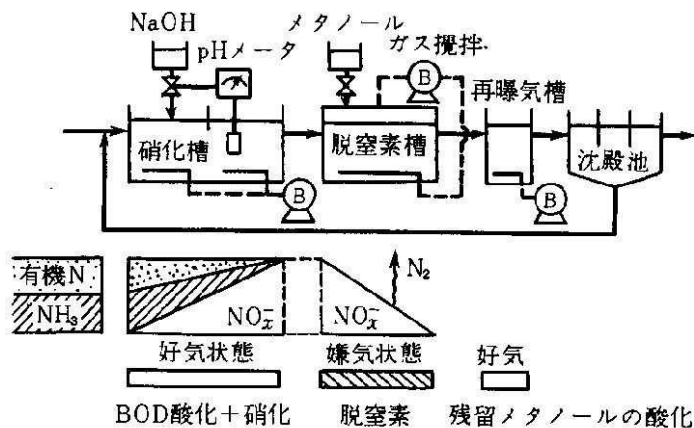


図 6・1 代表的な脱窒素活性泥汚処理プロセス

メタノール	methanol
p Hメータ	pH meter
ガス攪拌	mixing gas
再曝気槽	reaeration tank
硝化槽	nitrification tank
脱窒素槽	denitrification tank
沈殿池	settling pond
有機N	organic N
好気状態	aerobic condition
嫌気状態	anaerobic condition
好気	aerobic
B O D酸化+硝化	BOD oxidation and nitrification
脱窒素	denitrification
残留メタノールの酸化	oxidation of residual methanol

図 6． 1 代表的な脱窒素活性汚泥処理プロセス FIG. 6.1 Representative process of denitrification treatment of activated sludge

Regarding Difference 3,

According to the description (H), the Cited Document 1 discloses that "N-acyl homoserine lactones such as 3-oxo-decanoyl homoserine lactone and butyryl homoserine lactone" are added to sewage, as a cell-signaling chemical upregulating the microbial activity of bacteria responsible for the nitrification and increasing the rate of sewage decomposition.

Meanwhile, in paragraph [0006] in Japanese Unexamined Patent Application

Publication No. 2003-236555 (Cited Document 3 of the examiner's decision), it is described that the examples of "N-acyl homoserine lactones," include "N-butanoyl-L-homoserine lactone, N-[(3R)-3-hydroxybutanoyl]-L-homoserine lactone, N-hexanoyl-L-homoserine lactone, N-(3-oxo-hexanoyl)-L-homoserine lactone, N-octanoyl-L-homoserine lactone, N-(3-oxo-octanoyl)-L-homoserine lactone, N-decanoyl-L-homoserine lactone, N-(3-oxo-decanoyl)-L-homoserine lactone, and N-(3-oxo-decanoyl)-L-homoserine lactone."

As for "N-octanoyl-L-homoserine lactone", for example, "L-" indicates an "L-isomer" among optical isomers of "N-octanoyl-homoserine lactone," "octa" in "octanoyl" indicates the carbon number ("octa" indicates 8) in a substituent of "homoserine lactone," "noyl" indicates that the substituent is an "acyl group," and "N-" indicates that an octanoyl group is bonded to nitrogen of homoserine lactone.

Therefore, as "N-octanoyl-L-homoserine lactone" is "acyl homoserine lactone" having an "octanoyl group" with the carbon number of 8, the "octanoyl group" is bonded to nitrogen of "homoserine lactone" and "N-octanoyl-L-homoserine lactone" is an "L-isomer," "N-octanoyl-L-homoserine lactone" is a compound included in the concept of "N-acyl homoserine lactone."

Similarly, "N-decanoyl-L-homoserine lactone," "N-(3-oxo-hexanoyl)-L-homoserine lactone," and "N-(3-oxo-decanoyl)-L-homoserine lactone" are compounds included in the concept of "N-acyl homoserine lactone."

Further, there is no description of compounds corresponding to "C12-homoserine lactone" and "C14-homoserine lactone" in the above document, however, it can be said that a compound, among these compounds, in which the acyl group is bonded to nitrogen of "homoserine lactone" is a compound included in the concept of "N-acyl homoserine lactone."

Therefore, in the Cited Invention 1, it is common general technical knowledge that "N-acyl homoserine lactone," which is added to sewage as a cell-signaling chemical to upregulate the microbial activity of bacteria responsible for the nitrification and increase the rate of sewage decomposition, generally means compounds including, in addition to "3-oxo-decanoyl homoserine lactone" and "butyryl homoserine lactone," "C8-homoserine lactone, C10-homoserine lactone, C12-homoserine lactone, C14-homoserine lactone, 3-oxo-C6-homoserine lactone, and 3-oxo-C12-homoserine lactone," wherein the acyl group is bonded to nitrogen of "homoserine lactone."

Further, it is stated in Abstract of Applied and Environmental Microbiology, 2005, Vol. 71, No. 8, p.4906-p.4909 (Cited Document 4 in the examiner's decision), that "Nitrosomonas europaea strain Schmidt produces at least three acyl homoserine

lactone (AHL) signal molecules: C<sub>6</sub>-homoserine lactone (HSL), C<sub>8</sub>-HSL, C<sub>10</sub>-HSL."

"Nitrosomonas europaea strain Schmidt" is one of bacterias responsible for the nitrification of ammonia and "signal molecules" are "signaling molecules," regarding "HSL" means "homoserine lactone." So, "acyl homoserine lactone," "C<sub>6</sub>-homoserine lactone (HSL)," "C<sub>8</sub>-HSL," and "C<sub>10</sub>-HSL" are respectively "acyl homoserine lactone," "C<sub>6</sub>-homoserine lactone," "C<sub>8</sub>-homoserine lactone," and "C<sub>10</sub>-homoserine lactone."

Therefore, according to the Abstract of the Cited Document 4, it can be said that "acyl homoserine lactone" functioning as an intermicrobial signaling molecule produced by "Nitrosomonas europaea strain Schmidt," which is bacteria responsible for the nitrification of ammonia, includes "C<sub>8</sub>-homoserine lactone" and "C<sub>10</sub>-homoserine lactone."

Further, according to the description (H) in the Cited Document 1, "3-oxo-decanoyl homoserine lactone" and "butyryl homoserine lactone" are only examples of N-acyl homoserine lactone, thus "N-acyl homoserine lactones" are not limited to 3-oxo-decanoyl homoserine lactone or butyryl homoserine lactone.

In addition, in paragraphs [0032] [0033] of the detailed explanations of the invention and FIG. 2, there is no significant difference in action and effect among all the examples in which C<sub>4</sub>-homoserine lactone, C<sub>8</sub>-homoserine lactone, C<sub>10</sub>-homoserine lactone, C<sub>12</sub>-homoserine lactone, C<sub>14</sub>-homoserine lactone, 3-oxo-C<sub>6</sub>-homoserine lactone, 3-oxo-C<sub>12</sub>-homoserine lactone are used, while they have advantageous action and effect only in comparison with control examples or the comparative examples. The highest effect is caused with C<sub>4</sub>-homoserine lactone, which is not included in the Amended Invention. Thus, it cannot be said that a particular action and effect is caused by selecting a specific substance of "N-acyl homoserine lactones" included in the Amended Invention.

Therefore, on the basis of the Cited Invention 1, a person skilled in the art could have easily arrived at appropriately selecting substance functioning as a cell-signaling chemical of bacteria responsible for the nitrification of ammonia from a group of "N-acyl homoserine lactones," and adding the selected substance to sewage.

## 2-5. Summary

Therefore, since a person skilled in the art could have easily conceived of the Amended Invention on the basis of the Cited Invention 1, common general technical knowledge, and well-known arts, the appellant should not be granted a patent for the Invention independently at the time when patent application was filed under the provisions of Article 29(2) of the Patent Act.

### 3. Overall Summary

Therefore, since the Amendment violates the provisions of Article 126(7) of the Patent Act which is applied mutatis mutandis pursuant to the provisions of Article 17-2(6) of the Patent Act, the Amendment shall be dismissed under the provisions of Article 53(1) of the Patent Act applied mutatis mutandis by replacing certain terms pursuant to Article 159(1) of the Patent Act.

#### No. 3 Regarding the invention of the case

Since the amendment dated September 19, 2014 was dismissed as described above, the inventions according to Claims 1, 2 of the present application are specified by the matters described in OLD Claims 1, 2 of the scope of claims described in the written amendment dated March 4, 2014 (hereinafter referred to as the "Invention 1 of the case," for example, according to the claim numbers, and the "Invention of the case" as the whole).

The Invention 1 of the case is only to add "C4-homoserine lactone" as a choice of "intermicrobial signaling molecules" of the Amended Invention examined in "No. 2 2" above, and the other specific matters are identical.

On the other hand, according to the description (H) in the Cited Document 1, in the Cited Document 1, as "butyryl homoserine lactone" corresponding to "C4-homoserine lactone" which is one of choices of the Invention 1 of the case is described as an example of N-acyl homoserine lactone added to sewage, "the invention in which butyryl homoserine lactone is used to add to sewage in the Cited Invention 1, as N-acyl homoserine lactone" (hereinafter referred to as "Cited Invention 2") is also disclosed in the Cited Document 1. Therefore, Difference 3 between the Amended Invention and the Cited Invention 1, which are compared and judged in "No. 2 2-2 to 3" above, is excluded in comparing the Invention 1 of the case and the Cited Invention 2.

Further, as mentioned in "No. 2 2-2 to 3" above, Difference 1 and Difference 2 between the Amended Invention and the Cited Invention 1 are not substantial, these differences are not substantial between the Invention 1 of the case and the Cited Invention 2 either.

Therefore, since there is no substantial difference between the Invention 1 of the case and the Cited Invention 2, the Invention 1 of the case is the invention disclose in the Cited Document 1.

#### No. 4 Closing

As mentioned in "No. 3" above, the Invention 1 of the case is the invention described in the Cited Document 1, and the appellant should not be granted a patent for the Invention in accordance with the provisions of Article 29(1)(iii) of the Patent Act.

While it is not necessary to examine other claims, the application should be rejected.

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

October 21, 2015

Chief administrative judge:	MAMADA, Tadahiro
Administrative judge:	HAGIWARA, Shuji
Administrative judge:	NAKAZAWA, Noboru