

# Analysis of the Invention through an Experiment for Clarifying a Problem of Patent Law

—Based on Abstraction of Invention by “Principle and Its Use”, and “a Shape, a Structure, Properties and Their Transformation of an Article”

Kotaro Kageyama

Kageyama International Law & Patent Firm, Tokyo, Japan

Email: kageyamalaw@gmail.com

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## Abstract

Author proposed so far to arrange two-dimensional technology and inventions which are objects to judge the inventiveness and others for patent inventions, using two perspectives (coordinate axes), that is, 1) the combination, shape structure, and physical or chemical characteristics and its transformation of an article which are factors for a physical-object invention and a material invention, and 2) principle, its use and the ways of its use. This coordinates may show abstraction (norm-forming) for technology and inventions. There are, however, cases where the inventions are made through experiments and principles and their use are unknown. Most of material inventions are included in this case. This case usually shows difficulty in understanding problems under patent law such as invention and its identification of an article (including the relation with PBP claims also), inventiveness, interpretation of claims, etc. In this paper, Author will analyze inventions and try to arrange two-dimensional inventions through experiments, using the above two perspectives, especially about the above 2), considering the principles and their use supporting each raw materials and each manufacturing process, and furthermore considering the effect based on materials and manufacturing process above. Author will analyze inventions through experiments so as to help the actual patent practice, considering the relation with actual patent guidelines and using examples in patent gazette.

## Keywords

Inventions through Experiments; Shape, Structure, Property and Its Transformation of an Article; Principle, Its Use and Way of Its Use;

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## Arrangement of Technology in Two-Dimensional Coordinates; Abstraction (Norm-Forming) of Invention Facts

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### 1. Introduction

This paper tries to analyze the invention through an experiment which was not conventionally considered in two-dimensional arrangement of technology/engineering because of unclearness of principle and its use.

Until now, Author has attempted the clarification of an identification of an invention and a product (including a relation to a product-by-process claim (hereinafter referred to as “PBP claim”)), recognizing an inventor, inventive step, an interpretation of claim, and so on, as a problem of patent law, based on the categorization of an invention into a physical-object invention and a material invention (The Opinion 1) and the analysis of a formation process of an invention and the significant concern about the principle there (The Opinion 2). Moreover, Author also has considered about how to make an invention. Author published many papers about these issues. Author’s latest work in which his notion is gathered together into a whole in the book of the title of: “Unified Approach for Inventive Step and Claim Interpretation—Analysis based on the on physical/chemical principle and ways of its use, and the categorization of the physical-object/material invention—” (LAP LAMBERT Academic Publishing) (Kageyama, 2017), was published in Jun 2018 (hereinafter referred to as “Unified interpretation book”).

The above book is fundamentally based on the cases where “principle and its use” being used in the target technology/engineering and the invention are figured out. Because, this kind of case could be rather easy to compose a theory as an ideal type.

However, in practice, said “principle and its use” in the whole of an invention or a part of composition of an invention are incomprehensible in many cases, especially for a material invention case. The case where a PBP claim must be used is most typical one. In this case, an invention is almost made through experiment. In this paper, the formation and the content of the invention through an experiment are considered, and the clarification of the identification of an invention and a product and the problem on patent law are attempted. In fact, there are many problems which are hard to clarify in the case of the invention through an experiment.

In advance, this paper will clarify the said problem by way of abstraction (arrangement) of the fact which is related to technology/engineering and an invention, on the criterion (standard) of “principle and its use” and “physical-object invention and material invention, and a shape, a structure, and material-properties and its transformation of an article which are factors comprising the said two type of invention.

This paper, to make it useful for a practice, made a discussion in consideration

of the relation to an examination guideline about an identification of a product and inventive step etc., by analyzing the example of the patented invention disclosed in patent gazette. Since these issues are problems with a difficulty to be clarified originally, it is considered that a clarification should just be ever advanced one step in this paper. That is to say, Author is pleased if there would be some parts which are a view, a technique, etc. discussed in this paper and which readers can take in.

Please refer to the above-mentioned Unified interpretation book on account of limited amount of paper for an understanding of the more fundamental portion discussed in this paper.

## 2. The Meaning of Invention, The Opinion 1 and 2

### 2.1. The Meaning of an Invention. Principle-Its Use-Ways of Its Use

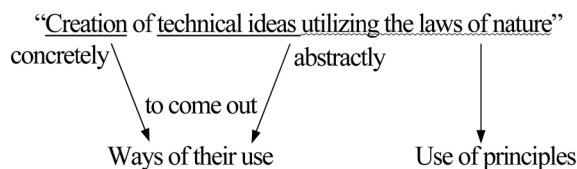
1) The Japanese Patent Law (Every cited law in this book is Japanese one unless otherwise noted), Article 2, Paragraph 1, defines an invention as.

“the highly advanced creation of technical ideas utilizing the laws of nature.”

In the above, the laws of nature are natural laws, most typically, principles of physics and chemistry.

For the “principle”, a tentative one shall suffice here. Its scope shall be interpreted flexibly and its level only needs to be very basic; for example, the basics of high school (at about 15 or 16 years old) physics and chemistry would suffice (or the degree of level is basically such that necessary understanding can be obtained by studying, as needed, starting from the knowledge of that level). Refer to the following **Table 1**, and the example of p.23 which shows the effects (use of principle) based on each ingredient of the beer taste drink as a further actual example.

2) The definition of an invention under the Patent Act in the preceding paragraph 1) can be put in order practically, centering the principle (the law of nature) and its use as follows.



Therefore, an invention, (when it is observed centering the principle), can be simply and more concretely stated as “ways of utilizing principles” in other words.

In the above, the keywords are “principle”, “use” and “ways of use”. Because of these keywords, in the following, discussion is made based on the analysis of an invention into (A) a principle, (B) its use and (C) ways of its use (Hereinafter referred to as “Principle-its Use-Ways of its Use”. This is abbreviated as “principle and its use” “principle-use” also in this paper).

**Table 1.** Example of a problem to be solved, principle, its use and ways of its use.

Problem to be solved	Extinction of fire (fire-fighting)
A. Principle	1) Prevent from contact with oxygen (to avoid oxidation). 2) Cool down (to lower under the firing point). 3) Remove things that may be burned (to remove oxidized substance).
B. Use of a principle	1) Cover with substances to prevent oxidation action such as carbon dioxide (CO <sub>2</sub> ). 2) Splash water on the burning objects. 3) Leave the burning objects away.
C. Ways of its use	1) Fire extinguisher—including other principles to spray CO <sub>2</sub> . 2) Fire fighting pumps—including other principles of pumping. 3) Tobacco firefighter: A type to separate the burning portion off.

From the problem to be solved to Principle-its Use-Ways of its Use, here is a familiar example: extinction of fire, as **Table 1**.

“Principle” and “its Use” are, so to speak, intangible, “Ways of its use” appears as a model which is a product having an effect of an invention, and has tangible aspect.

3) The way to use a product is one face of “Way of use of principle”.

Japanese Patent Law places great significance on utilization of inventions as follows.

a) An invention means “... a creation of technical ideas utilizing the laws of nature” (Patent Law Article 2 (I), b) as one of requirements for patent, “an invention that is industrially applicable” may be patent (Article 29 (I)), and c) the purpose of this Act is “through promoting the protection and the utilization of inventions, ...” (Article 1).

“Utilizing” in said a) means “use of principle” literally, “applicable” in said b) can be understood as “way of use of principle” since it is prescribed as “industrially”, and “utilization” in said c) contains “use through working” and “use as literally document”. And the “use through working” can be apprehended as “way of use of principle”, since it is related to industrial use. The “use as literally document” can be apprehended as “use of principle”. Therefore, said c) can be understood to include both, “way of use of principle” and “use of a principle”.

Use invention can be called the invention which focuses attention on “use of a principle”, since it relates to attribution (material-properties) of material.

In this paper, an invention of a product will be taken as a basic case. In a case of an invention of a process, each stage connected in time series can be understood as a technology of a product or its transformation.

4) Matters specifying the invention are “all matters necessary to specify the invention for which the applicant requests the grant of a patent”. (Article 36 (5)). It is called “constituent features” to a judicial precedent. “The invention for which a patent is sought” must be indicated clearly. (Article 36 (vi) ②). And Japanese examination guideline expresses as follows: “and to that end, the matter specifying the invention shall be clear” (Part II Chapter 2 Section 3 Clarity Requirement 2.1 (1)); “the meaning of a term (Author’s Note: matter specifying the invention) in a claim” “must be comprehensible to a person skilled in the art”

(same section 2.2 (1) b); and “the technical meaning of a matter specifying an invention refers to the function or role that these elements play in the claimed invention” (same section 2.2 (2) b. Author attached the wavy line).

Regarding the above-mentioned matters, from the meaning of the word, it is considered that the “function” is indicated from an aspect of feature of working and the “role” is indicated from an aspect of effectiveness (the examples of function and role are referred to (9.2) later patent gazettes (A) ([0007], [0015], [0022], [0026]) etc.).

Then, it is considered that “function” is common to “principle” or “its use”, and “role” is common to “ways of its use”. If that is correct, it could be common to analyzing an invention as “principle”, “use of a principle” and “way of use of principle” in this paper. The concept of “Principle-its Use-Ways of its use” is considered to be rather clearer than a “function” and a “role”, since it has technologically decided meaning more.

Furthermore, from the viewpoint of “abstraction of a fact itself” described in 4 later, the “function” and the “role” are facts themselves (everyday expression also as word). On the contrary, Principle-its Use-Ways of its use proceeds to the abstracted concept. The meaning and contents could be clarified by way of making abstraction as a regulation (examination guideline is also a regulation).

## 2.2. Physical-Object Invention and Material Invention (The Opinion 1)

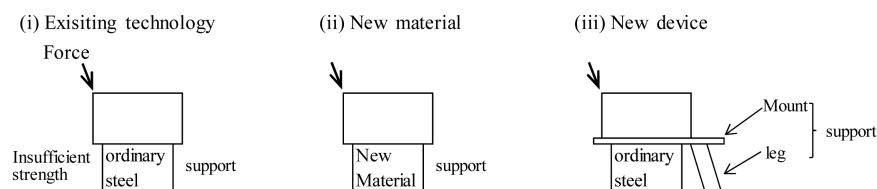
Invention can be categorized into a physical-object invention and a material invention from the way of showing up (looks, appearance and property).

A physical-object invention is an invention that focuses on the shape, physical structure, and the combination of articles, such as circuits (its appearances). A material invention (invention for substance) is an invention that focuses on the properties of an article (including their transformation) that are used in the invention.

As an example, we consider the case of a very simple technology/engineering as shown in **Figure 1**. To support the force applied in the direction of the arrow, (i) if the existing technology does not provide sufficient strength to support the force, one may come up with two new ways; (ii) to increase the strength of the material used for the support; or (iii) to distribute the force load by adding a leg portion to the opposite side where the force is applied.

The support in (ii) is made of an alloy (new material) that has increased strength than ordinary steel. In (iii), the load from the force is distributed using a support that is either a combination of the mount and a leg portion or a device with a shape as shown in (iii). Here, (ii) is a material invention and (iii) is a physical-object invention.

With regard to the technology and the invention from the standpoint of a user, Author considers the typical factors of the combination, shape and structure of an article, and the physical property, chemical property and transformation of the property of a material (In this paper, it is called “6 factors”).



**Figure 1.** Invention of new material (material invention) and a new device (physical-object invention).

Regarding the above mentioned “6 factors”, originally saying, a combination, a shape, and a structure of an article are the contents of the definition of physical-object invention, and physical properties, chemical properties, and transformation of their properties are of material invention. 6 factors are the concepts which are common to the Opinion 1.

With regards to Author’s opinion of the categorization of the physical-object invention and the material invention, please see footnote<sup>1</sup> for more detail.

### 2.3. Significant Consideration of a Principle from a Formation Process of an Invention (The Opinion 2)

Using an example of inventing an airplane (if the term “airplane” does not exist, it would be something like “an apparatus to carry people flying in the sky”), we can consider what **Figure 2** shows.

This invention is fundamentally the invention of a machine field of a physical-object type.

What is most important in the above process is the “establishment of a model” ([2] (B) (i)) for embodying the conception and the “conception based on a principle” ([2] (A) (ii)) for proposing the conception. Note that inventors are those who have contributed to either of the above.

Please refer to Author’s work Unified interpretation book in detail about the above (2.1) (2.2) (2.3) and the following 3.

### 2.4. Arrangement of a Technology/Engineering and an Invention by Two Dimensions from the Essence of Said Two Kinds of Invention

6 factors mentioned above (2.2) are essence of invention extracted from physical-object and material inventions of the Opinion 1 which paid attention to an invention at appearance and property. Principle-its Use-Ways of its Use described in the above (2.1) 2) are essence of an invention based on “ways of utilizing principles” (significant consideration of principle is based on the Opinion 2). These are based on the Opinions 1 and 2. Author has pointed out that an invention can be comprehensively grasped through understanding its actual state and a history of generation based on the Opinions 1 and 2 (in detail refer to Unified interpretation book).

Then, arranging a technology/engineering and an invention in two dimensions

<sup>1</sup>Kotaro Kageyama, “The Physical-Object Invention and the Material Invention-Efficient Use of a Categorization Based on Looks (Appearance and Property)”, Beijing Law Review, Vol.8, No.3, 2017.

[1] Purpose of an invention (problem to be solved)	- want to make an apparatus to carry people flying in the sky
[2] Formation process of an invention (A) Conception (proposal of <sup>*1</sup> ) (i) Mere intuition	- make an apparatus that has a structure like a bird
(ii) Conception based on a principle	- make an object float in the air using air resistance by propelling it forward (generate a lifting force for an object using air resistance caused by propulsion force)
(B) Embodiment of the conception (i) Establishment of a model	- install a power device in an object to rotate a propeller etc., and establish a structure having wings with a specially devised shape
(ii) Experiments, calculations <sup>*2</sup>	- conduct progressive experiments starting from (a) parts such as propellers and wings, to (b) a miniature of the airplane body, and proceeding to (c) a full-sized airplane body - obtain necessary experiment results/experiment formulas and calculation results/calculation formulas
(iii) Adjustment of the model (iv) Completion by repeating (i) to (iii)	- something that is practically applicable/usable

<sup>\*1</sup> In the case of a joint invention, conception needs to be proposed; otherwise, it is very difficult for the other relevant parties to understand.

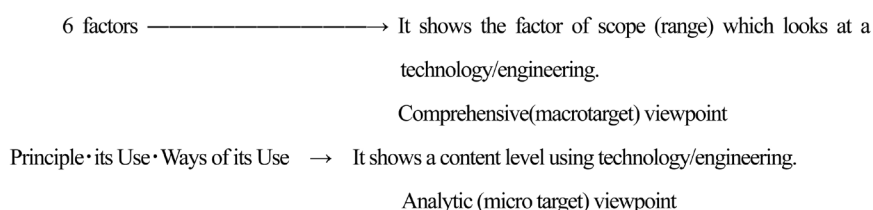
<sup>\*2</sup> Generally, experiments and calculations are conducted considering the parts to start with and then the whole, and also starting from the miniature then expanding to the full-sized object. Here, calculations include computer simulations.

**Figure 2.** Purpose of an invention and the formation process of an invention (the case of inventing an airplane).

by setting these two essences as axes of coordinates will be considered, as **Table 2**. Because, by this way, it is considered whether technology/engineering and invention must have been grasped totally, inter relatively (from two axes), and analytically.

Adding to say, 6 factors and principle (“Principle-its Use-Way of its Use”) are described by two axes intersected perpendicularly. But, the relations among them would have relevance each other if they are analyzed in details. This is reasonable, because each of them is essence of an invention.

Generally, the following viewpoints can be used to construe 6 factors and Principle-its Use-Ways of its Use



Although each axis of coordinates itself has its own logic of an arrangement, the correlation can be shown if it is arranged in two dimensions (example, two-dimensional arrangement of **Table 2**). Even if correlation cannot be shown, at least, two-dimensional arrangement can be made.

### 3. Case of the Formation of an Invention through an Experiment (The Opinion 2)

A very large number of cases require experiments as a means of forming an invention (especially, in the case of most material inventions).

In this paper, the case of a material type is mainly considered.



**Table 2.** Framework of the technology/engineering and invention according to the view of use.

Opinion1 Opinion2	a) Combination	b. Shape	c. Structure	Property		f. Transformation of property
				d. Physical	e. Chemical	
A. Principle						
B. Use of principle						
C. Ways of its use						

### 3.1. The Formation Process of the Invention through an Experiment

1) Invention is approved when the phenomenon in which a good result is obtained with sufficient reproducibility by the experimental condition conformed under a certain principle is found out.

2) There are cases where the principle is unclear (unknown) or difficult to understand, but an invention may be formed through experiments by discovering a “reproducible phenomenon”, that is, “a relation that a certain fixed effect is obtained by a certain experimental condition”.

In this case, the formation process can be described as follows.

The person taking action thinks of a tentative principle, and sets experimental conditions. If a successful result is obtained as a consequence, that would mean that an invention is completed. In the above, the “tentative principle” is something that is presumed to be the most accurate for the sake of achieving the purpose at the point of starting an experiment, and that serves as the basis for advancing the experiments, one way or another. However, it is not normal that the experiment successfully yields a good result after one attempt (process). So, based on the result obtained, the (tentative) principle used in the previous experiment shall be corrected. Based on this corrected version, a new tentative principle is derived, which will be used as the basis for setting experimental conditions for obtaining the next result. By repeating this process, using experimental conditions established under a tentative principle ( $B_1$ ), a good result as reproducible phenomenon ( $B_2$ ) is produced. At this point, one can say that an invention is completed.

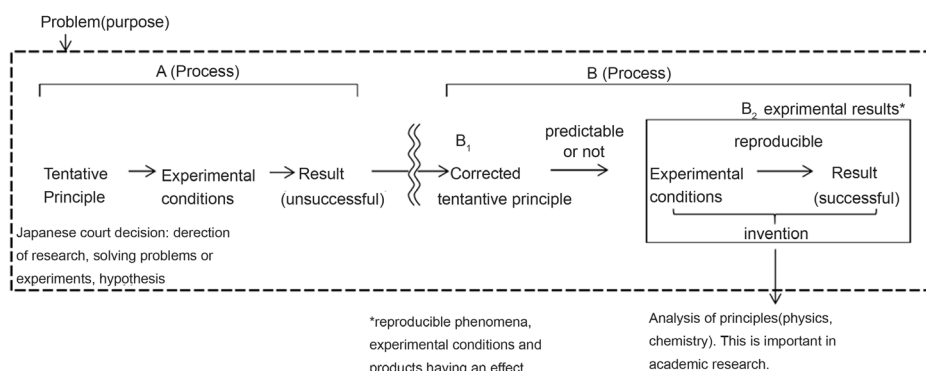
The above process can be shown in time series in **Figure 3**.

### 3.2. The Cases of the Tentative Principle being Sufficient to Allow Prediction of the Experimental Conditions or a Product Having an Effect and Being Insufficient to Allow Their Prediction

The above (3.1) 2) etc. are considered as follows.

1) If the principle is difficult to understand, and when the invention is formed, the “tentative principle” ( $B_1$ ) in **Figure 3** is distinguished from “experimental conditions or a product having an effect” (experimental results,  $B_2$ ) and is sufficient to allow their predictions; then, consideration of a tentative principle is





**Figure 3.** Processes where an invention is formed by experiments.

regarded as “conception based on a principle”. In this case, where necessary experiments are conducted, what corresponds to “establishment of the model” is the setting of experimental conditions and obtaining a product having an effect under those conditions. Being “sufficient to allow prediction” here can be interpreted as a degree such that  $B_1$  and  $B_2$  are suitably close, and technically, that  $B_1$  and  $B_2$  are in a relationship where “ $B_2$  can be explained based on  $B_1$  using the theory of physics and chemistry, taking the level of technology at the time into consideration”.

2) However, presumably, it is likely that there are few cases of the tentative principle being sufficient to allow prediction of the experimental conditions or a product having an effect. In such a case, the tentative principle is considered to remain only as “a mere intuition”. Discovery and use of reproducible phenomena shall be replaced with the conception based on a principle. The reproducible phenomena, experimental conditions and products having an effect all appear integrated at the same time. Even in this case, the principle does exist, though it may be difficult to understand, therefore, it can also be said that this principle and the model appear integrated. It is thought that such cases are many in the case of material invention.

3) Another case where an invention is formed by experiments is the case where the principle can be understood, but it is difficult to predict the model from the principle, and hence, it is necessary to perform experiments. In this case, the model (experimental results) could be a product having an effect, an apparatus or an experiment formula, and so on.

It seems that the experiment in **Figure 2** [2] (B) (ii) shows just this case.

### 3.3. Difficulty of Prediction of an Experiment

An experiment has a degree where experimental results cannot be predicted (difficulty of prediction). It depends on the degree with which a principle and its use could be understood.

In the case of the above (3.2) 2) where a tentative principle is insufficient to allow prediction of experimental conditions or a product having an effect, a reproducible phenomenon replaces a principle, and a reproducible phenomenon,

experimental conditions and a product (fact) are appear all at once in an integrated manner, and a principle and its use are not clear.

With regard to this, Principle-its Use-Ways of its Use forms an inventive concept, but a reproducible phenomenon, experimental conditions (ingredient and operational conditions) and a product having an effect are the facts which constitute invention (it is called as the “invention facts” in this paper). Here, comparing to a reproducible phenomenon, experimental conditions and a product having an effect, for example, the kind and a combination ratio which constitute an ingredient, and temperature and pH etc. which constitute the condition for operation, and composition and concentration, etc. which constitute the product having an effect are temporarily expressed as “a fact itself”. On the contrary, it is because a reproducible phenomenon, an experimental condition and a product having an effect are already “the facts in which arrangement (abstraction) is carried out to some extent”.

Both correspondence situations are as shown in **Table 3**.

Although a producible phenomenon is replaced with a principle, it shall be considered to relate to a principle and its use naturally.

Since Principle-its Use-Ways of its Use is abstracted, it can be used taking out a method from a technical, social and cultural accumulation which are obtained from human beings’ many years effort.

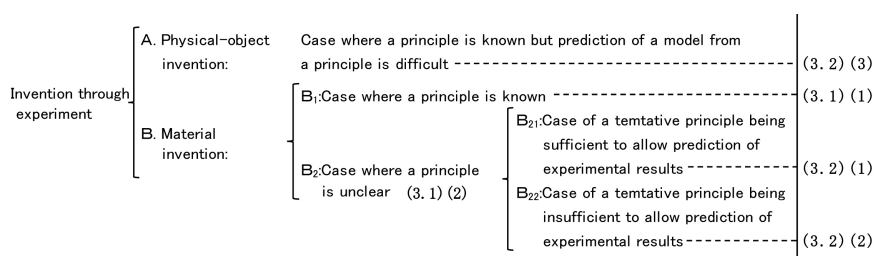
### 3.4. Arrangement of Invention through Experiment

An Invention through experiment is considered to be easy to arise in the following cases as shown in **Figure 4** in reality. A right end position is the part described in this paper.

Among the above, this paper deals with B<sub>2</sub> invention (case where a principle is unclear), especially focusing on B<sub>22</sub> (case of a tentative principle being insufficient to allow prediction of experimental results). Because that case is easy to arise as invention which could form only through an experiment and its clarification is difficult. And it is because starting from the Opinions 1 and 2 which

**Table 3.** Inventive concept and invention facts.

Invention		
Concept	Fact	Fact itself (example)
Principle	Reproducible phenomenon	
Use of a principle	Experimental Conditions(Process) <div>             Ingredient                           Operational conditions           </div>	<div>             Kind                           Combination ratio                           Temperature                           pH etc.           </div>
Ways of use of principle	Product having an effect	<div>             Composition                           Concentration           </div>



**Figure 4.** Classification of an invention through experiment.

Author has heretofore asserted, advancing its clarification using a notion and a method which consists of 6 factors and Principle-its Use-Ways of its Use, reproducible phenomenon, experimental conditions and a product having an effect, could be helpful to specify the product and to clarify the problem on patent law in relation to B<sub>2</sub> or B<sub>22</sub> invention.

#### 4. Abstraction and Norm-Forming for Identifying Invention and Clarifying the Problem on Patent Law, and Their Criterion

From this section, consideration will be made centering the case (B<sub>22</sub> in **Figure 4**) which is material invention through experiment, and the case where a tentative principle is not sufficient (insufficient) to allow prediction of experimental results (hereinafter, it is also termed “the case of a tentative principle being insufficient to allow prediction” or “the case insufficient to allow prediction also”)

##### 4.1. When an Invention Is Formed, Facts Relevant to an Invention, and Their Abstraction and Norm-Forming (to Become Regulation)

- 1) Case of general invention (including the case which is a material type and where its principle is understood) as **Figure 5**
- 2) Case of a material invention through an experiment and where a principle is unclear

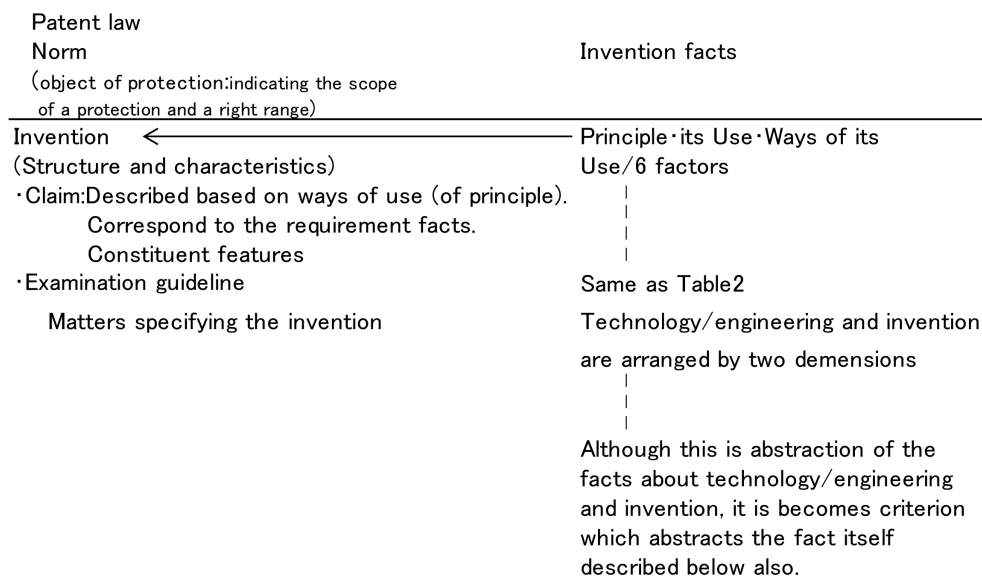
- a) Case sufficient to allow prediction in **Figure 6**
- b) Case insufficient to allow prediction in **Figure 7**

However, difficulty of prediction has different degree (levels). In relation to the example described in 9 later, patented invention from (A) to (C) increase difficulty in their order. i.e. patented invention (A) < patented invention (B) < patented invention (C).

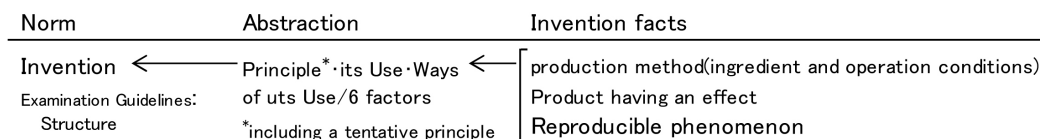
##### 4.2. Necessity and Criteria of Abstraction and Making Norm

- 1) Since law pegs out the range of a right and duty, it is required for clarity, simultaneously, should have predictable range as a norm in social life. For this purpose, fact described in law is not the mere fact, but it must be abstracted, and it must be clear and be able to predict.

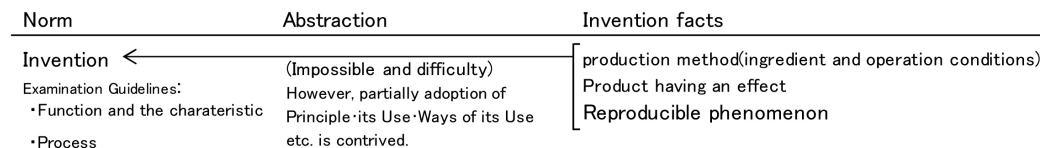
Also, an invention should (a) be legally specified (forming norm and patenting),



**Figure 5.** Making invention facts norm in general invention.



**Figure 6.** Abstraction and norm-forming of invention facts in the case sufficient to allow prediction.



**Figure 7.** Abstraction and norm-forming of invention facts in the case insufficient to allow prediction.

and (b) be abstracted to solve a legal issue. Regarding (a), since description in a claim pegs out the scope of rights, invention facts should be expressed in abstract style so that it can be understood clearly and widely.

In order to abstract, criteria are needed. These are “Principle-its Use·Ways of its Use/6 factors”. As the above (2.4), since these criteria arrange the essence of technology/engineering and invention by two dimensions, they are appropriate. Here, “criteria” are used, so to speak, as types.

Since 6 factors can be applied from the appearance and property of an invention result, it is a criterion which can be used as a preceding step of Principle-its Use·Ways of its Use. (a) Principle-its Use·Ways of its Use, and (b) 6 factors can be used as a simplified or detailed ones depending on a technical field (refer to the example of p.28 later).

2) In the case above (4.1) 2) a), Principle-its Use·Ways of its Use/6 factors (criteria of abstract and forming norm) are understandable, and they constitute the invention as is. Considering an actual clarification, a principle may include a

tentative principle. However, in the case (4.1) 2) b), criteria are unclear.

Thus, it is difficult to specify the invention and clarify the problem on patent law. However, even in this case, the reproducible phenomenon, the experimental conditions and the product having an effect which constitute the invention are facts, but are those that are arranged to a certain extent from facts themselves. Therefore, it should be considered whether the above mentioned criteria are applicable or not to each factor by analyzing and examining their factors

### 4.3. Relation with Examination Guideline

1) The above experimental conditions (ingredient and operational conditions, or a starting material and a manufacturing process) could become criteria or pursuant to them. Its grounds on regulation are considered as the next.

Part II Chapter 2 novelty and inventive step in “Examination guideline and operational guidance for examination” describes that when (a) a starting material is the same and a manufacturing process is similar, and (b) a starting material is similar and a manufacturing process is the same, novelty and inventive step could be suspected. Thus, the technical contents which should be determined are arranged from the viewpoint of a starting material and a manufacturing process (abstracted in that meaning). This will be some help. Moreover, naturally, in the specification of application, a working example must be shown. This just corresponds to a reproducible phenomenon.

2) Therefore, the above operation by guideline is common to the abstraction of invention by the reproducible phenomenon, the experimental conditions (ingredient and operational conditions) and product having an effect in this paper. This shows the proof that in the case of invention through experiment and a tentative principle being insufficient to allow prediction of experimental results, the identification of invention and abstraction by the reproducible phenomenon, the experimental conditions and the product having an effect are right.

The reproducible phenomenon, the experimental conditions and the product having an effect can be used as criteria of the abstraction replaced with Principle-its Use·Ways of its Use in the case of a tentative principle being insufficient to allow prediction of experimental results. In this case, the tentative principle could be informative guide depending on a situation. Because we cannot help considering the facts regarding an invention comprehensively as the criterion of abstraction, even if a tentative principle is insufficient to allow prediction of experimental results, and there it is a range of difficulty of prediction.

In addition, with regard to the above criterion, as 6 factors are related to appearance, it is considered to be useful to arrange the case finally and to make an invention (method to solve) concretely (the example p.34).

Moreover, abstraction is useful to arrange and accumulate technology/engineering, and also to make it easy to use. It is also useful to compare with the technology/engineering of the other company.

3) The portion about patenting in the examination guideline is the more concrete criterion of operation of Patent Law. The above criterion appears, as the

requirement of description in claim and detailed description of invention (enablement requirement, support requirement and clarity requirement) in the application procedure.

As **Figure 8**, identification of the product in examination guideline is defined with a phased approach by determined level (degree), that is, that of abstraction and norm-forming (part II, chapter 1, section 1, enablement requirement 3.1.1, chapter 2, section 3, clarity requirement 4.3.2).

In the material invention, many cases insufficient to allow prediction belong to (ii), cases sufficient to allow prediction belong to (i) (a physical-object invention is also the same), and cases insufficient to allow prediction and extremely exceptional belong to (iii).

In addition, as explained previously in (2.1) 4), “working” and “role” stated in the technical meaning of the matters specifying the invention in the examination guideline are fact themselves, and “Principle-its Use-Ways of its Use” is the abstracted notion or notion used as criteria for abstraction.

#### 4.4. Relationship with Inventive Concept

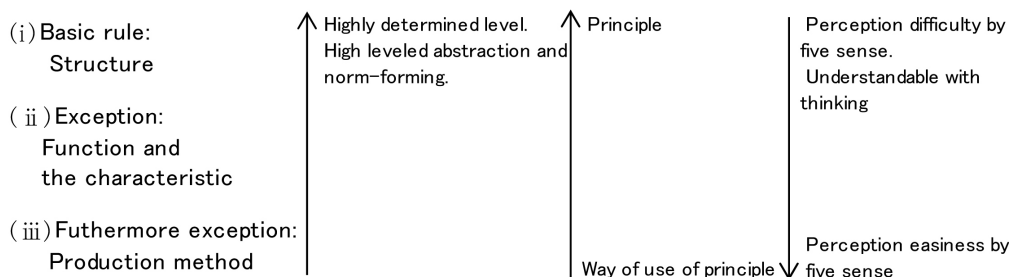
Although the protection interest by Patent Law is inventive concept, it is, so to speak, in an inner portion of invention as thought (idea). This is not necessarily shown concretely and must be read by the description of a claim and consideration of a detailed description of invention (Article 70).

If the relationship of Invention facts, criterion of abstract, invention and inventive concept is arranged notionally, as **Figure 9**.

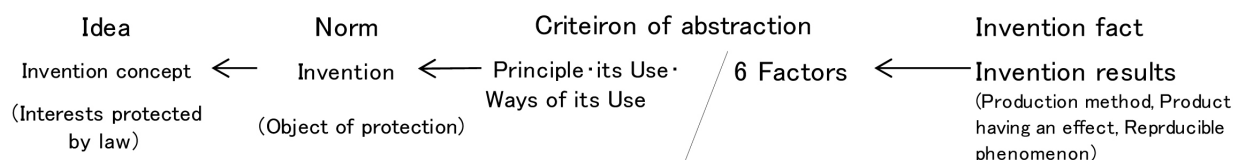
### 5. Application of the Criterion of Abstraction and Norm-Forming

#### 5.1. Application to the Essence of a Material Invention, the Appearing Way, and the Way of Expression (Identification)

Regarding the following cases A and B, that is, A; the case of a material invention and where a principle is known (this case is shown as B<sub>1</sub> in **Figure 4**, and as **Figure 5**), and the case of an invention through an experiment and a tentative principle being sufficient to allow prediction of experimental results (this case is shown as B<sub>21</sub> in **Figure 4**, and as **Figure 6**), and B; the case of an invention



**Figure 8.** Identification of the product by structure, function and the characteristics, and production method.



**Figure 9.** Principle-its use-ways of its use as criterion of abstraction.

through experiment and a tentative principle being insufficient to allow prediction of an experimental results (this case is shown as B<sub>22</sub> in **Figure 4**, and as **Figure 7**), arrangement of the above essence, etc., of an invention briefly can be shown as **Table 4**.

Product in material invention can be asserted as follows. Although in case A in the above table a norm can be made by using Principle-its Use-Ways of its Use as criterion, in case B in the above table a norm cannot be made by using Principle-its Use-Ways of its Use. Instead of it, the process etc. which are the arranged fact are used.

Although a PBP claim is one specified by a production method, it is a representative case insufficient to allow prediction. The way of appearance of this kind of invention is limited on above mentioned range, therefore, a way of expression (method to be identified) cannot help being as mentioned above.

According to the examination guideline quoting Supreme Court decision on 5 June 2015, a PBP claim is admitted only when “it is impossible or utterly impractical to define directly the product by its structure or characteristics” about the product (examination guideline part II, chapter 2, section 3, 4.3.2). An applicant is required to assert and prove the existence of the about impossible or impractical circumstances. A PBP claim is admitted based on fairly political requirements as shown in the wording “utterly impractical”.

A process needs to be written in a detailed description to both of the above A and B. This shows manifestation or grounds that essence of product invention in material invention is the process (a product does not arise without producing).

## 5.2. Comparison with the Patent Law and Civil Law about Forming a Norm from Facts

As the example above, the comparison is made between patented invention and an illegal act from the aspect of success and failure as shown in **Table 5**. Since infringement of patent rights is one of the illegal acts, it is shown together.

Civil Law, as a general private law applied among private persons, is easy to understand the criterion to abstract and form a norm, as it is close to fact itself. On the other hand, as a special law in which patent law had speciality nature, it can be said that the criterion is more apart from the fact itself. Therefore, a definition may be required to clarify the criterion itself in some cases.

In addition, the theory of a requirement fact can be said to have translated the criterion to abstract and form a norm into reality. Claim is just a requirement fact.



**Table 4.** Essence of material invention, appearing way, way of expression (identification).

		A. •Case of material invention and a principle is known •Case of invention through experiment, and a tentative principle being sufficient to allow prediction of experimental conditions and product having an effect	B. Case of invention through experiment, and a tentative principle being insufficient to allow prediction of experimental conditions and product having an effect (typical case is PBP claim)
essence (Inventive concept)		Principle · its Use · Ways of its Use	Principle · its Use · Ways of its Use, but it is unclear
Way of appearance (Invention facts)		Principle (including a tentative principle) · its Use · Ways of its Use	Reproducible phenomenon { Experimental conditions(process) · ingredient · Operational conditions Product having an effect
Way of expression (identification)(abstraction, forming a norm)	Claim	Ways of use of principle	Process (ingredient and operational conditions)
	Detailed description of the invention	Ingredient and operational conditions (examples) Including a principle and its use. 6 factors	Reproducible phenomenon, ingredient, operational conditions. 6 factors
	Examination guideline	Structure, function and characteristic	Process (Production method)

**Table 5.** Norm forming of patented invention and illegal act.

	Patented invention	Illegal act	
			Infringement of patent rights
Fact itself	Invention facts	Infringement act · Incurred damage	Infringement act · Incurred damage
Criterion of norm forming (abstraction)	Principle · its Use · Ways of its Use. 6 factors	Right or interest to be protected by law	Patent right (description of claim)
Norm	Description of claim	Infringement of other's right or interest to be protected by the law based on intention or negligence, and compensation of damage	Infringement of the patent right and compensation of damage

## 6. Correspondence Relationship between Identification of the Product in Examination Guideline and the Description Requirement of Specification, and the Inventions Which Are Physical-Object Type Material Type and through an Experiment

### 6.1. Correspondence Relationship

The above relationships can be arranged into **Table 6** based on the contents

**Table 6.** Identification of the product, description requirements of specification, and inventions which are a physical-object type a material type and through experiment.

Application			Trial examination				
			Identification of product		Descriptive requirements for claim and detail description of invention		Requirements for patent (novelty, inventive step etc.)
Regulation	Legal basis	Patent Law Article36(V) Examination guidelines written in Part II Chapter1 Section1 3.1 Enablement requirement etc.	Patent Law Article36 (IV) ①Enablement requirement Article36 (VI)①Support requirement (claim) Article36 (VI)②Clarity requirement (claim)		Examination guidelines —Part II Chapter1 Section1 3.1 — Part II Chapter2 Section2 2.2 — Part II Chapter2 Section3 2.2,2.3, 4, 4.1, 4.1.1, 4.1.2, 4.3.2		Patent Law Article29( I )(II) etc. Examination guideline
	Contents	Basis rule:Structure etc.* <sup>1</sup> Exception:Function and the characteristic* <sup>2</sup> Further exception: Process(PBP)  * <sup>1</sup> Structure, Shape and Composition of product etc.  * <sup>2</sup> Function,Working,Property, and Characteristic of product  Technical meaning of the matters specifyin invention	Basis rule for description (3.1)	Exception of description(3.1)	Points of concern(4.1.1)	4.3.2	
			A.Structure  Enablement requirement  Support requirement  Clarity requirement	B.Function and Characteristic Structure is described in detail description of invention	C.Tchnical field with difficult prediction of the structure from a function and a characteristic.  Technical field with difficult to understand the relation between the function and characteristic, and the structure.	D. Circumstances where specifying with structure or characteristic is impossible or unpractical (PBP). Assertion and proof for that is required	
Correspondence with Author's view	Correspondence with an physical-object type and a material type	In case(iii), since a tentative principle is considered sufficient to allow prediction fo a structure or a function and a characteristic, this will be used.	(i)physical-object type, (ii) material type where a principle is known		(iii) a material type where a tentative principle is sufficient to allow prediction of an experimental results (few)	(iv) a material type where a tentative principle is insufficient to allow prediction of an experimental results (many)	
	Correspondence with the criterion of judgement		Principle :its Use-Ways of its Use		Reproducible phenomenon, Experimental conditions, Product having an effect		
Author's view and Regulation	<div>Physical-object invention :shape, structure</div> <div>Material invention: physical and chemical properties, and their transformation</div> <div>Case where a principle is known</div> <div>Case where a principle is unclear</div> <div>Case of a tentative principle being sufficient to allow prediction of experimental results</div> <div>Case of a tentative principle being insufficient to allow prediction of experimental results</div> <div>(i) — Basis rule A, ExceptionB</div> <div>(ii) — Basis rule A, ExceptionB</div> <div>(iii) — Points of concern in exception C</div> <div>(iv)*<sup>1</sup> — Further exception D*<sup>2</sup></div> <div>*<sup>1</sup> (iv) has cases of points of concern in exception C and further exception D</div> <div>*<sup>2</sup> Even in case D(PBP), the claim is shown by a process, naturally in the whole, also in partial</div>						

argued in this paper up to now. The matters and the grounds which are not fully defined in the examination guideline will be clarified by considering the correspondence relationship between identification of the product and the description requirements of specification, and Author's opinion, such as a physical-object type and a material type etc.

Explanation is added about **Table 6.**

1) Established content C in the examination guideline, which is “a technical field where it is difficult to predict the structure from the function or characteristics” or “the technical field with difficulty to understand the relation between a function and the characteristics, and structure”, corresponds to the technical

field of a material invention according to Author's opinion.

Although the essential point explained in examination guideline says that prediction and grasp of structure are difficult, this is the feature of a material type (invention). To begin with, the present patent law and examination guideline are constituted on the basis of the physical-object invention which is traditional invention. And it is considered that the material invention is treated by using the above expression exceptionally as "the technical field ... difficult ... a function or characteristics". However, this expression is unclear. Once, "chemical substances" was used as example word. This is typical example of a material invention, but material invention can include an invention for medical-supplies, daily commodity, and so on, also. Therefore, the range of material invention will be indefinite only by raising an example like the above.

But, fundamentally, a physical-object invention and a material invention are the concepts which should be juxtaposed, and it is rational to introduce the concept of a material invention. Regarding above-mentioned matters, please refer to the Unified interpretation book in detail.

In this paper, "... difficult technical field" in the above-mentioned C is classified into (iii) a case of a material invention and a tentative principle being sufficient to allow prediction of experimental results, and (iv) a case of a material invention and a tentative principle being insufficient to allow prediction of experimental results. And a PBP claim is classified as a case where difficulty of prediction is extremely high (D in the criterion), and (ii) even a material invention, when a principle is known it is treated like (i) a physical-object invention.

2) Furthermore, 6 factors are abstracted from a fact itself like the above (4.2). A physical-object type and a material type for invention are newly established notions. Since 6 factors which constitute them are abstraction of facts, a physical-object type and a material type can be said as further abstraction.

If abstraction progresses, it will become a notion applying to a case, which has clarity and a certain amount of width, but its definition is also needed.

Therefore, it is considered that a definition of a physical-object type and a material type should be also set up like (2.2) in this paper, and they should be effectively used as Author stated in 1).

## 6.2. The Portion Where This Paper Tried to Clarify Especially

The said portion is that with regard to a material type in "correspondence with Author's opinion" of **Table 6**, a principle and its use to (iii) or experimental conditions etc. to (iv) are the subject of the determination, by whether is (iii) sufficient to allow prediction or (iv) not (further difficulty of prediction). As a conclusion, in the case (iv) and that aims at an experimental conditions etc. an adoption of a principle and its use may be contrived, and conversely when this is impossible or impractical, a PBP claim must be selected (refer (8.2)). In the following 7, the way of this contrivance will be inspected concretely, and in 9, the actual example of invention will be considered.

## 7. Concrete Discussion Applying Experimental Conditions, Tentative Principle and Effect in the Case Insufficient to Allow Prediction

### 7.1. Point of View

1) Since the difficulty of prediction has strong and weak grade as whole technology/engineering and invention, each portion of technology and invention should be inspected. a) Depending on the problem to be solved, the ingredient and each process of experimental conditions may be sufficient only by inspecting the fact itself, and b) principle and its use or reproducible phenomenon (phenomenon which is objectified and abstracted to some extent, and a third party also seems to be able to determine) which support ingredient and each process of an experimental conditions may be figured out. Then, it is considered to apply the theory which was formed in the case sufficient to allow prediction by contriving to use the above-mentioned fact, a principle and its use, and a reproducible phenomenon as criteria as much as possible.

2) As the problem or the portion for which the fact itself is sufficient, the problem of the patent law which should be solved, for example, as 11 later, is considered as follows.

a) The problem for which the fact itself is sufficient

i) Since an inventor is a person who participated in acquisition of the reproducible phenomenon, the experimental conditions or the product having an effect, fact itself will be sufficient for recognizing as the inventor.

ii) About a PBP claim, fact itself will be sufficient for the requirements to admit it. However, according to Author's opinion, since the identity of the product in the infringement of a PBP claim is recognized in the case where the tentative principle is almost common and the structure and the characteristics of the product which can be predicted from it are almost the same, the tentative principle must be known.

b) The portion sufficient by the fact itself

i) Regarding an inventive step, as described in the above operational guidance of an examination guideline concerning a PBP claim, similarity of comparing two products is acknowledged when (a) the starting materials are the same and manufacturing process are similar, and (b) the starting materials are similar and manufacturing process are the same. About the same portion, comparing fact itself will be sufficient. The difference of the similar portion may be determined by similarity of principle and its use supporting it. Incidentally, it seems that it will be easy to find out the difference in the principle used if ingredients are different.

ii) Also as to an interpretation of claim, what is necessary is just to understand the compared two, that is, the description of claim and the suspected technology in a same way.

### 7.2. The Grade of Understanding the Principle and Its Use Supporting the Ingredient and Each Process

There is the grade of understanding also in the principle and its use supporting

the ingredient and each process of experimental conditions, as follows.

(a) understand mostly. (b) seems to be so. (c) not understand at all. Case (c) is decided by effect.

It is considered that, in the principle and its use supporting the ingredient and each process in above (a) and (b), a tentative principle in the case sufficient to allow prediction of the experimental results may be included. For example, shown in **Figure 10**, a tentative principle is used in A and B of the ingredient and the process, and effect  $X_3$  is used in C. Concerning  $X_3$ , determination is made by increase of the effect adding C (so to speak a adding method) or that remaining effect which is gained by deducing  $X_1$  and  $X_2$  from the whole effect X is produced by  $X_3$  (so to speak a subtraction method). It had better to be determined from both sides generally as described in **Figure 10**.

## 8. Identification of the Product in the Compound, the Mixture, the Solid and Liquid/Gas of a Material Type

The following is seemed to be said conceptionally as follows.

### 8.1. The Classification of Material Invention and Easiness of Identification

1) As to a compound and a mixture which are easy to be produced in the material invention which consists of two or more substances, it is considered that easiness of identification (easy: ○) is shown in **Table 7**.

The above is what was seen from a viewpoint where an invention is generated, and if it is a new product of a compound, the manufacturing process will be considered to be the essence of the invention.

2) Prediction of the contribution of each component to the product having an effect

If it is a mixture of a liquid and a gas, the interaction of each component of ingredient is not so strong that contribution of each component to the product (manufactured goods) can be predicted and the prediction of the contribution of each component to the whole product is also considered as those sum totals.

3) Reversibility/irreversibility in a production method

In the above case 2), it is considered that an injection order of ingredients is not so important (reversible). On the contrary, since a compound is produced with a chemical reaction, an injection order of ingredients is important (irreversible).

Experimental conditions	Ingredient and starting materials, Operational conditions and process	Example (ingredient, process)	Tentative Principle	Effect	Adding method	Subtraction method
		A	understand mostly	$X_1$		
		B	seems to be so	$X_2$		
		C	can not understand	$X_3$	By adding C $X_3$	$X_3 = X - X_1 - X_2$
		Sum total		X	Based on an experiment.	

**Figure 10.** Experimental conditions, tentative principle and effect in the case of the tentative principle being insufficient to allow prediction of experimental results.

**Table 7.** Compound and mixture, and easiness of identification.

	Solid	Liquid/Gas
Compound	×	mostly ×
Mixture	mostly ×	○

## 8.2. Identification of a Product

If it is the mixture of a liquid and gas even if it is a material invention, it would be considered that identification of the product by structure or the characteristics is possible.

Therefore, the case where an applicant cannot help using a PBP claim is one of the compounds producing a chemical reaction. However, in (9.3) later, even a mixture of the liquid, it would be accepted using a PBP claim by the impractical criterion. Also as described in (5.1), even if a PBP claim is specified by a production method, when structure and properties about produced materials including a using material such as ingredient etc. and what is generated in the middle in the process can be understood, those should be used to define the claim. Especially for composition, since it is easy to measure it with the present technology, it should be used in many cases. Also above-mentioned description would be applied to the case where a production method is used to not only the whole but also a part of the invention for the identification of the product.

## 9. Examples of Discussion in Actual Japanese Patented Invention

### 9.1. Patented Invention (A): (Japanese Patent No. 6285996. All Patent Numbers Are Japanese Ones in This Paper), (B): (No. 5917763), (C): (No. 6150495)

Regarding the above patented inventions, the classification described in especially (8.1), the positioning in **Table 6**, the meaning of making a patent, and the effectiveness of the exercise of right etc. would be discussed.

Above cases are related to material invention, and of a tentative principle being insufficient to allow prediction of experimental results, so that they correspond to (iv) in “correspondence with an author’s opinion” in **Table 6**. Concerning them, (A) is close to (iii), and it is considered that the product could be specified with structure and characteristics. An applicant cannot help using a PBP claim by an impractical criterion for (B), and he/she cannot to help using a PBP claim by an impossible criterion for (C), as the result, his/her these assertions were accepted. According to the author’s opinion shown in (8.2), the reason of acceptance is that though (B) was a mixture, it could be construed that an identification by a structure and characteristics was impractical, and (C) was impossible because of a compound.

Taking out the applicable portion of **Table 6**, if (A), (B) and (C) can be positioned, they would be mostly as described in **Table 8**.

**Table 8.** Positioning in Table 6 of patented invention (A), (B) and (C).

	Points of concern(4.1.1)	4.3.2
	C,  (A) (B) (C)	D. Impossible and impractical circumstances(PBP)
	(iii)Case sufficient to allow prediction	(iv)Case insufficient to allow prediction
	Principle· its Use· Ways of its Use	Reproducible phenomenon, Experimental conditions, Product having an effect

## 9.2. Patented Invention (A)

Title of invention “Beer taste drink and its production method” [No. 6285996]

### 1) Claim

Beer taste drink wherein, containing a extracted matter and water soluble dietary fiber of wheat origin, amount of purine bodies is less than 1.1 mg/100mL, amount of the said water soluble dietary fiber is 0.5 to 3.0 w/v%, and containing a sour substance which is 325.7 - 805.7 ppm by citrate conversion, the said sour substance is more than one kind of substance among a citric acid, a lactic acid, malic acid, tartaric acid, fumaric acid, succinate acid, and a phosphoric acid.

### 2) Discussion

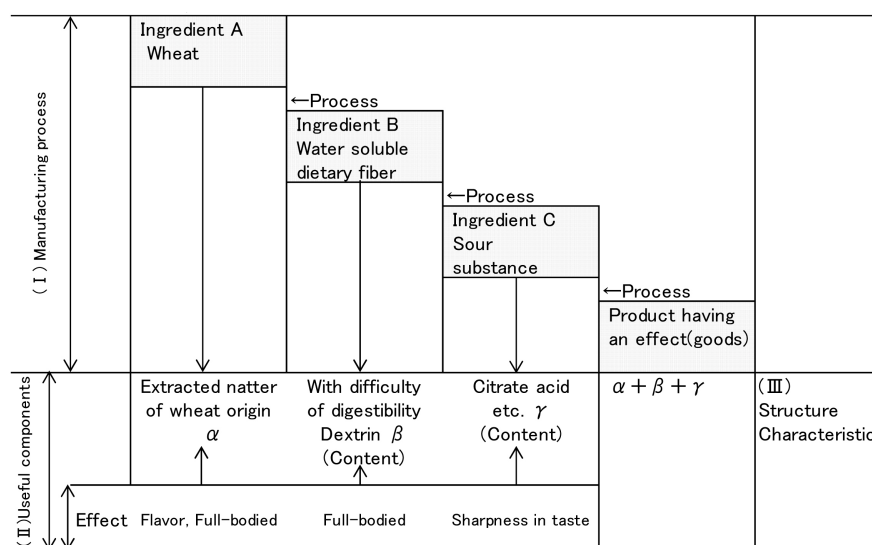
a) If a construction of the above patented invention is arranged and is shown pictorially, it would be as **Figure 11**.

### b) Tentative principle

The tentative principle is as follows. Beer taste drink where the enzyme contained in yeast constrains the action producing alcohol, and a substance producing flavor, full-bodied, and sharpness in taste which are peculiar to beer, is added.

From the above-mentioned tentative principle, it is insufficient to allow the prediction of experimental results. However, as shown in (II) of **Figure 11**, the effect (full-bodied, sharpness in taste etc. use of principle) over the product having an effect based on a principle (reproducible phenomenon) caused by the useful component of the each ingredient ( $\alpha$ ,  $\beta$ ,  $\gamma$ : possibly also a process) can be predicted to some extent together with common general knowledge of technical/engineering (known) (refer to patent gazette [0007], [0015], [0022], and [0026] etc.). (III) And regarding this case, it is supposed that a partial structure (content) and the characteristics (III) of the product were shown (ways of use of principle). Therefore, identification of the product was made. The effect of the said useful ingredient corresponds to a “work” and a “role” described in “matters specifying invention” in (2.1) 4) earlier. In addition, effects include the effect of minus. The purine bodies indicated to the claim in a previous page 1) is a thing of wheat origin and is explained that it is not good to gout etc. for raising a uric acid value (known), the content of it is constrained (patent gazette [0016]).





**Figure 11.** Ingredients, process, useful components, and the structure characteristics of beer taste drink yeast is added in a fermentation process.

Therefore, this case can be treated to be sufficient to allow prediction of experimental results.

(iv) That is, although it is (iv) in **Table 6** and **Table 8**. The effect of the product can be predicted from the tentative principle partially shown with each ingredient etc. Therefore, as shown in **Table 6** and **Table 8**, it is considered that not an experimental condition, a product having an effect etc., which originally correspond, rather more abstracted Principle-its Use-Ways of its Use can be used as criteria of determination.

#### c) Identification of invention and classification of invention

In **Figure 11**, if the structure and the characteristics of a product can be shown by (II), it can form the patented invention of a product under the condition that the identification as a product could be made.

The above case is considered to be the case which is a mixture of a liquid and interaction of each component is not strong (it is common to a physical-object type in this point).

### 9.3. Patented Invention (B)

Title of invention “Liquid seasoning and its production method” [No. 5917763]

#### 1) Claim

[Claim 1]

Production method of liquid seasoning comprising of; mixing a sea tangle essence extracted by hydrated alcohol and a sea tangle stock extracted by warm water, so that the mass mixture ratio of the said sea tangle essence and the said sea tangle stock when the using amount of the said sea tangle as ingredient is converted identically, should be in the range of 4:6 - 8:2, the said sea tangle essence is obtained by carrying out hydrated alcoholic extraction of the said sea tangle on the following conditions, extracting solvent: 20 - 60 (v/w)% alcoholic

water solution extraction temperature: 30°C - 70°C extraction time: less than 2 hours and the said sea tangle stock is obtained by carrying out warm water extraction of the said sea tangle on the following conditions, extraction temperature: 60°C - 80°C extraction time: —less than 2 hours

[Claim 5]

Liquid seasoning manufactured by the method described in any claim from claim 1 to 4.

## 2) Discussion

a) The above case is a mixture of liquid and it is considered that the interaction of each component is not strong.

However, it is considered that the effect over the product having an effect by the principle derived from ingredient and component is difficult to predict.

b) Regarding the identification of the product by a structure and characteristics in this case, an applicant's following insistence was accepted. "About Sensuous evaluation component for a feeling of sea tangle stock, an elongation of the taste, and an elongation of the afterglow of aroma and the taste etc. if it says whether those characteristics can be expressed correctly and objectively, as its single component is a combination of two or more components, saying whether their character are expressed precisely and concretely, even if it takes the present technical common knowledge into consideration, the factors and a numerical expression in which these effects originate are very difficult". Therefore, in (iv) of **Table 6**, identification by structure and the characteristics was accepted not to be practical, and using a PBP claim was admitted.

However, the mixed rate which is the most important point of the composition of a mixture was shown.

## 9.4. Patented Invention (C)

Title of the invention "Coffee composite" [No. 6150495]

### 1) Claim

A coffee composite wherein: containing a grain of covering parched coffee powder.

a coating of a covering composite contains at least one sort of component that glass transition temperature is from 30°C to 60°C, and is formed on at least a portion of the surface of coffee powder, the said covering composite contains one or plural sort of components which are chosen from an instant coffee, a coffee extract, a tea extract, dairy products, a sweetener, a nutritional supplement, and the group that consists of those combination, and the said coffee composite is obtained by the method including; a step of heating the mixture of the covering composite which have at least one sort of components having the glass transition temperature of 30°C - 60°C and roasted coffee powder, at a temperature higher than the said glass transition temperature of at least one sort of the said components and lower than a melting point of the said covering composite, and also this heating step is that covering composite is heated till forming the cover

over at least a portion of the said roasted coffee powder, but the roasted coffee powder does not receive the further parching during the said heating, and a step cooling the said mixture and obtaining a parched coffee powder having the said coating of the said covering composite formed on at least a part of surface of the said parched coffee powder.

## 2) Discussion

a) In the above case, parched coffee powder and a covering composite are solid mixtures. It can be said that a chemical reaction or transformation of chemical properties occurs between the covering composite and parched coffee powder and in the covering composite. Therefore, it is considered that the effect over the product having an effect of ingredients and components is difficult to predict.

b) Regarding the identification of the product by a structure and characteristics in this case, applicant asserted as follows. “At the time of covering, though a covering composite is in a special state, i.e., even a solid state, it is considered that bonding of molecules is in the loose state have influenced more than little. It is not clear what kind of influence has reached on the structure and the characteristics of a product. Moreover, even if it is going to specify the ‘coffee composite’ described in the claim, for example by the characteristics of adhesion nature, it is unclear that the state of the interface of coffee powder and a covering composite should be expressed to what kind of index it is transposed. And In order to find out the said index, too much trial and error are required, and it is extremely impractical.” This assertion was admitted and it is accepted that in (iv) of **Table 6**, identification by the structure and the characteristics was impossible (see the word of the above “unclear”), and it was admitted to use a PBP claim.

However, this case is put in an effort to clarify a material-properties value (if this is a melting point, it may be easy to make clear, but the quality of glass is depend on a process) which is not clear like a glass transition temperature of a coating of the covering composite which is an important composition material, and also clarify that its temperature is lower than a melting point, and also to quote it to an identification of a product.

## 9.5. Relation with the Execution of Right etc.

1) Concerning patented invention (B) and (C), although each patent is obtained, when a problem of an infringement occurred, it is difficult to prove an identity of the product between a patented invention and an object product, therefore execution of right will involve difficulty.

According to Author’s opinion, identity is accepted when it can be said that the tentative principle of patented invention and an object product is almost common, and the structure and the characteristics of a product having an effect which can be predicted from the tentative principle are almost the same (identity of composition is necessary).

However, probably, the above-mentioned proof will be impossible or very dif-

ficult. In this regard, the same thing will be presumed if the same process is used.

2) That is to say, if it is a mixture and patent acquisition can be somehow carried out by identification of the product by structure and the characteristics, a scope of rights would be widely accepted in the case of the execution of right at a later date. However, if patent is obtained only by a PBP claim, practically, its right range is restricted to the same process, and becomes narrow, and the execution of right would be difficult.

3) It is considered that it is useful for progress of technology to accept the acquisition of right by a PBP claim from the point of disclosure of an invention without staying it in know-how. On the other hand, it is considered that the practice of this right is difficult, therefore it is considered to be hard to produce the obstruction to the technical progress by this right. Therefore, there is a utility of admitting this right.

## 10. Two-Dimensional Arrangement of the Technology/Engineering and Invention through Experiment

### 10.1. The Framework of Two-Dimensional Arrangement

The following **Table 9** shows two-dimensional arrangement of the (2.4) earlier using reproducible phenomenon, experimental conditions and product having an effect as an ordinate axis. Although all of horizontal axis consist of material type, it is the example which subdivided the factor to a certain extent.

Even if an arrangement and a criterion of the item within both axes are existed, the correlation between axes is unknown.

Above, “composition” is included to identify a “product having an effect” and it is considered that composition should be expressed on identification of a product etc. as much as possible. Because composition can be understood substantially. On the contrary, if it is the epoch-making new material, identification centering on composition may be sufficient.

### 10.2. Example of Two-Dimensional Arrangement

Concerning factor (item) of the horizontal axis of **Table 9**, the two-dimensional arrangement with effectiveness by taking out a required portion and also subdividing could be performed. As one example, **Table 10** shows the material properties of material type (invention) and their transformation described in table (2.4), based on physical properties, chemical properties, blended properties and their transformation.

Next **Table 11** shows the above properties of material type(invention) and their transformation together with the main operational conditions in two dimensions.

One example which is a way of arrangement of facts of invention through experiment will be as **Table 11**. It may also be able to consider that a tentative principle and its effect are applied to it.

**Table 9.** Two-dimensional arrangement using reproducible phenomenon, experimental conditions, and product having an effect.

	Material type (material invention)					
	Physical properties	Chemical properties	Blended properties	Transformation of physical properties	Transformation of chemical properties	Transformation of blended properties
Reproducible phenomenon						
Experimental conditions						
Ingredient						
Operation conditions						
Product having an effect						

**Table 10.** Physical chemical physical properties and their transformation.

	Properties	Transformation of properties
Physical	density, viscosity, coefficient of thermal expansion, electrical conductivity	transformation of phase (ex. crystallization) (ex. evaporation, liquefaction, solidification)
Chemical	composition, molecular weight, pH	chemical reaction neutralization, oxidation-reduction
Blended property	melting point, boiling point	dissolution, diffusion, hydration, suspension

It is considered that arranging an object technology/engineering from the above viewpoints is helpful to abstraction and norm-forming (patenting), furthermore, as a technical accumulation (seeds), easiness to use could be achieved. Therefore, it is considered to be useful for the level of the common argument in a company and for an education.

Moreover, it is considered that a range of a technology which must be set to a PBP claim for obtaining a patent also become clearer.

## 11. Arrangement for a Clarification of the Problem on Patent Law

Author, heretofore, has considered with reference to the case where a principle and its use are known about the problem of the patent law described in the preface, and has delivered many papers. Please refer to Unified interpretation book for this.

On the other hand, invention through an experiment discussed in this paper is

**Table 11.** Properties and their transformation, and reproducible phenomenon, experimental conditions and product having an effect.

Example	Material type (invention)					
	Properties			Their transformation		
	Physical	Chemical	Blended property	Physical	Chemical	Blended property
	viscosity, coeffect of thermal expansion	composition, molecular weight, pH	melting point, boiling point	transformation of phase (ex. evaporation, liquefaction, solidification and crystallization)	Chemical reaction neutralization, oxydation–reduction	dissolution, diffusion, hydration, suspension
	electrical conductivity					
reproducible phenomenon						Application is made to use a tentative principle and its effect.
experimental conditions						
ingredient						
operational conditons						
temperature, pressure						
pH, atmosphere						
product having an effect						

a case where principle and its use are unclear, and especially, experimental results are hard to be predicted from a tentative principle. Next, about the issues of the patent law in this case, how an elucidation can be advanced under contrast with a case where a principle and its use are known, one of its view will be shown.

### 11.1. Relation with a PBP Claim

Regarding a PBP claim, according to Author's opinion, it should be admitted only to a material invention and naturally becomes invention through an experiment. Therefore, this is also mentioned in this paper in each part.

A PBP claim is a claim for the case where a reproducible phenomenon, experimental conditions, and a product having an effect appear as one unit, and cannot be distinguished most clearly Principle-its Use-Ways of its Use among the invention through an experiment<sup>2</sup>.

First, the requirements to admit a PBP claim are the case where a principle is unclear, and "it is the case where a tentative principle is insufficient to allow the prediction of experimental results". And it should be admitted only to a material invention, and attention is focused on its characteristic stage (step). However, since an invention covers a broad range, an exception could be accepted by con-

<sup>2</sup>Please refer to Author's following paper for a PBP claim in more detail. Kotaro Kageyama, "Necessity, Criteria (Requirements or Limits) and Acknowledgement of Product Identity of Claims for Product Described by Its Manufacturing Process (Product-by-Process Claims)", Beijing Law Review, Vol.5, No.2, 2014. In furthermore detail, Author's following book. Kotaro Kageyama, "Recognition of Inventor/Joint Inventors and Product-by-Process Claims-based on Consideration of Categorization into Physical-Object & Material Inventions and Formation Process of Inventions", LAP Lambert Academic Publishing, Germany, 2015. p. 227.

sidering invention individually. Physical-object invention has no interaction accompanied by transformation of material-properties in each stage of a process, and each stage remains individually as component part of a product. Therefore, it is not necessary to consider it as a PBP claim.

Next, in order to carry out execution of right of the patented invention using a PBP claim, identity of a product described in a claim and an object product (an article suspected to infringe the patent right) must be proved. Concerning this, according to Author's opinion, when tentative principles which can be understood from the claim and the object product are almost common, and it can be said that the structure and the characteristics of product having an effect which can be predicted from the tentative principle are almost the same, their identity supposed to be accepted (in many cases, since the identity of composition can be understood, it will be needed). Therefore, a tentative principle should come to be understood. At first, if a manufacturing process of an object product is the same as that in the description of a claim, they are presumed to be same products.

### **11.2. Relation with an Inventive Step, and with an Interpretation of Claim**

Please just refer to Unified interpretation book in detail.

#### **1) Inventive step**

Inventive step is non-easiness in conceiving of the application invention act or un-obviousness of the application invention act from the prior art (cited invention). According to Japanese precedents and an examination guideline, its determination is based on criteria, so to speak, applicant's subjectivity etc. such as whether motivation or suggestion which are derivation of act exists or not. Criterion whether reasoning can be performed could be said as tautology (synonymous repetition). And, on these days, now, these are difficult or not sufficient to determine an inventive step, problems to be solved is emphasized (problems to be solved and solution means approach). However, although a problem to be solved is objective as a fact, it is on outside of invention (it can be understood from the fact that a problem to be solved is unnecessary for creativity and those who present only a problem to be solved cannot be recognized as an inventor (refer to (11.3) later). Therefore, it is not appropriate to consider it as an object (criterion) for determination of an inventive step.

"A principle and its use" (object) which is a target of an act should be criterion for determination of inventive step.

Inventive step should be determined by the difference and its extent of a principle and its use being used for the application invention and the prior art. By means of this, criterion of determination for inventive step is objectified and clarified, and nature of quantity can also be taken into consideration.

By the way, invention through an experiment conducting the problem in this paper is a case where a principle is not clear and a tentative principle is insufficient to allow prediction of experimental results (**Figure 4 B<sub>22</sub>**). In this case, it



could be thought as follows.

Concerning two technology and invention which are compared, in ingredient and each process (element) which constitute the experimental conditions in ordinate axis of **Table 11**, the one which has difference between them is considered to be classified to: a (tentative) principle (a) mostly understood, (b) seems to be understood, and (c) cannot be understood. Then, as explained in (7.2), in the cases (a) and (b), the tentative principle is considered to be the principle or its similar thing, and in the case (c), the difference of their effect is considered, and similarity is determined by it.

## 2) Claim interpretation

Claim interpretation is a problem of interpretation of fact and it should be judged by the difference of the principle and its use supporting each composition of patented invention and object technology (suspected infringing technology). Although inventive step is a problem of the interpretation of an act and claim interpretation is a problem of interpretation of fact, both are common in the point that an object for judgment should be the difference of principle and its use (reason of the wording “unified approach...” in Unified interpretation book).

The doctrine of equivalents is given as the most delicate problem in claim interpretation.

This is the problem whether it is appropriate to accept as what conflicts with patented invention, when object technology has a difference to the patented invention literally and is not included in its composition, as an object equal to patented invention from the substance of the invention.

With regard to this, there are six requirements which are shown by Japanese Supreme Court decision on 4 February, 1998. Substantial requirements among them are: 1) a difference is a non-essential part, 2) a different part is possible to substitute, 3) substitution is easy (easy conceiving). These should be determined based on a principle and its use. From this Author’s viewpoint, 1) means “a principle and its use” of the patented invention, 2) means the degree of a difference of the objective “principle and its use” between two technology to be judged, and 3) means whether the said difference can be small subjectively also in the case. Although 3) is expressed by the act (subjectivity) (at this point, same as inventive step. Subjectivity may be taken into consideration depending on a case), the object of judgment is, essentially, the difference of an objective “principle and its use”.

In an invention through an experiment in this paper, a principle is not clear and a tentative principle is insufficient to allow prediction of experimental results.

Also in this invention, as same as the above inventive step, concerning a part having a difference among a principle and each process which compose an experimental conditions of a technology and an invention, “similar or not” of the said technology and invention is judged based on an extent of understanding a

principle (tentative principle) or on a effect in the case where a principle cannot be understood.

### 11.3. Recognition of the Inventor (Joint Inventor)

Recognition of inventor becomes problem when plural number of persons participated in joint invention. And, when it becomes joint invention, a joint inventor's contribution rate (ownership rate) poses a problem.<sup>3</sup>

As explained earlier in the formation stage of invention (2.3), since a conception based on a principle and an establishment of a model is the most important acts when a principle is understood, a person who contributed to them is inventor.

However, an invention through an experiment in this paper is not necessarily clear about a principle. And like the above (3.2), there are (a) a case of a (tentative) principle being sufficient to allow prediction of experimental results, and (b) a case of a principle being insufficient to allow its prediction. In case (a), a person who conceived the tentative principle, and a person who contributed a generation of experimental conditions or a product having an effect are inventors. In case (b), persons who contributed to experimental conditions, a reproducible phenomenon, or a product having an effect are inventors.

And whichever in the above cases, an extent of contribution becomes contribution rate (ownership rate).

As mentioned above, with regard to invention through an experiment when its principle is not clear, the fact (itself), that is, a tentative principle, (replaceable) a reproducible phenomenon, an experimental conditions and a product having an effect should be just set as the object of determination for recognition of inventor and calculation of a contribution rate. Therefore, it is no need to recognize by extracting "a principle and its use" from these facts in particular.

### 11.4. How to Make an Invention

Here, concerning how to make an invention, it is examined in the range relevant to the argument which has been explained until now. Please refer to Unified interpretation book in more detail.

1) According to the above-mentioned book, the following is raised, as a viewpoint of the progress and the motive for invention to be formed.

- a) viewpoint of Principle-its Use-Ways of its Use,
- b) viewpoint of physical-object type and material type,

<sup>3</sup>With regard to the recognition of an inventor, in the case by an experiment and joint inventors, please refer to the following Author's paper. Kotaro Kageyama, "The Practice of Recognizing an Inventor/Joint Inventors and the Calculation of Contribution Ratios among Joint Inventors", *Journal of Intellectual Property Law and Practice (Oxford Journals)*, Vol.7, Vol.8, 2012. In furthermore detail, Author's following book. Kotaro Kageyama, "Recognition of Inventor/Joint Inventors and Product-by-Process Claims-based on Consideration of Categorization into Physical-Object & Material Inventions and Formation Process of Inventions", LAP Lambert Academic Publishing, Germany, 2015. p.1.

c) viewpoint of factors (6 factors) which are shape, structure, material properties, and their transformation,

d) viewpoint of formation process of invention.

It is considered that the chance of an invention could be grasped with the viewpoint which arranged technology/engineering in two dimensions from the above a) and b).

2) How to make an invention from Principle-its Use-Ways of its Use

As one view, it is considered that how to make an invention is roughly progressed in the following order.

a) About the conventional technology, “Principle-its Use-Ways of its Use” has already known. “Ways of its Use” expresses composition of technology (model).

b) Problem to be solved (subject) can be read from “Ways of its Use”. “Use of principle” could be explored from this.

c) As means for solving a problem, i.e. way of making an invention, it is performed that at first “Principle” and “its Use” are not changed. Then, “Ways of its Use” is changed based on them. It is thought in fact that there are many these cases.

d) If the problem cannot be solved by using a way of the above c), it should be changed from “Principle” and “its Use”, and should ask for new “Ways of its Use”.

e) In above d), the case where a “Use of a principle” is changed is not sometimes necessarily easy. In fact, adding new “Principle” is considered in many cases. In this instance, combination with the conventional principle will be used. Then, if the effect by synergy is acquired, it is much better.

3) Making invention from the formation process by experiment.

In the following cases, inventive step will be accepted, wherein:

a) Tentative principle and the true principle which was known later are distant away.

b) The repeat of an experiment is required.

c) It is hard to conceive a tentative principle or its use, based on an example from other technical field or a purpose of a technology also.

d) It is hard to consider two or more combinations of a principle and its use.

e) The problem to be solved (purpose) was not considered conventionally or the solution means was considered to be difficult.

f) An effect is very useful in social life or in industry.

4) Concerning the material invention through an experiment, two-dimensioned arrangement of the technologies which are the factors about a material type among 6 factors, and reproducible phenomenon replaced with a principle and its use, experimental conditions (ingredient, operational conditions) and a product having an effect, is considered as shown in **Table 11**. It is useful for extraction of a problem, and decision of solution to see the factor of the horizontal axis of this table across boundaries.

From the above-mentioned technical accumulation (seeds), it is thought that

an invention could be formed. This view is common to the invention through an experiment about TRIZ in the next. However, Author's opinion is considered to grasp a technology from a more general viewpoint in a sense than TRIZ's contradiction matrix and its invention principle.

5) Finally, consider how to make an invention by analyzing a patent gazette according to the International Patent Classification Table (I.P.C.).

Since the sub group in the I.P.C. described in the patent gazette shows the portion corresponding to the technical feature based on "Use of a principle" especially in many cases, a careful examination will be performed keeping this in mind. Then, it is good to read the patent gazette taking note of the description of a function and an operation, and read "Ways of use of principle". Standing on it, invention based on new is figured out.

### 11.5. Relation with TRIZ

TRIZ is "the scientific technique which produces invention" which is initiated by G. Altshuller who was a patent examiner of the former Soviet Union and analyzed a huge number of patent cases (patent gazette etc.). Afterward it has spread out to Western countries.

TRIZ is, as shown in "B" of **Table 12**, a method for acquiring concrete solution where the problem raised concretely is applied to the contradiction matrix which consists of the factor of  $39 \times 39$  as a general problem, and some principles are used among the 40 solution principles (ex. 4) corresponding to each measure of the contradiction matrix.

It is considered that framework of TRIZ which is; "raising of concrete problem → general problem (contradiction matrix) → general solution (solution principle) → concrete solution" is right.

Regarding a relation with the argument of this paper, Author's opinion uses a combination of 6 factors and Principle-its Use-Ways of its Use to a content of the above framework, i.e. between causes → solution direction in **Figure 12**.

TRIZ, as being also used the word of a "solution principle", premises the case where principle and its use can be understood. However, it is considered that the invention through an experiment in this paper could use the framework of the TRIZ method in the case of a tentative principle being insufficient to allow prediction of the experimental results, as shown by the word "as shown in **Table 11**" in the square frame on the middle of **Figure 12**.

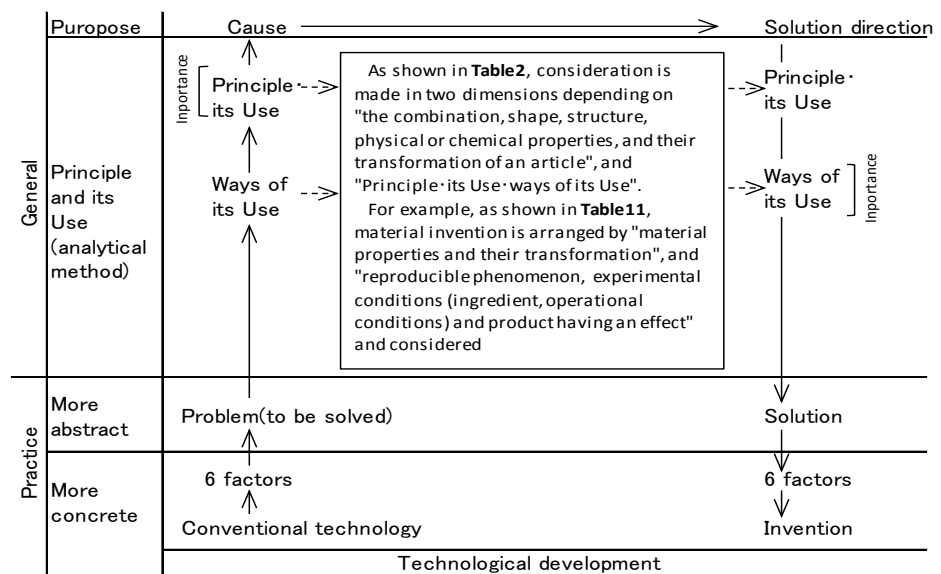
With regards to Author's opinion of TRIZ, please see footnot<sup>4</sup> for more detail.

Between Author's theory in this paper and TRIZ, as shown in **Table 12**, the meanings of abstraction differ about Principle-its Use-Ways of its Use and experimental conditions etc. In this paper, Principle-its Use-Ways of its Use and experimental conditions are the criterion to abstract for a clarification of the problem on patent law. On the other hand, in TRIZ, they are ways of making an invention,

<sup>4</sup>Kotaro Kageyama, "Analysis of TRIZ's Invention Principles", *The TRIZ Journal* (<https://triz-journal.com/>), January 23, 2018.

**Table 12.** Meaning of abstraction of a principle and experimental conditions etc. in this paper and TRIZ.

	A. This paper	B. TRIZ	
Purpose	Clarification of problem on patent law, Way of making an invention	Way of making an invention	
As criterion	Normative forming (law) Abstraction (same as TRIZ)	Generalization, Abstraction	Abstraction General problem → General solution (contradiction matrix) (solution principle)
		Concrete	Proposal of concrete problem      Concrete solution



**Figure 12.** “6 factors” and “principle and its use”, and way of making an invention.

but in this paper’s theory, Principle · its Use · Ways of its Use and experimental conditions etc. are related to a way of making an invention also.

Please refer to References as regards basic analysis based on the Opinion 1 and 2 on the relationship with TRIZ.

## 12. Making Out Specification, Written Opinion and Amendment. Technical Accumulation (Seeds)

What Author discussed in this paper should be kept in mind naturally when patent department member, patent attorney etc, are making out a specification, a written opinion, and an amendment, etc. (however, pay attention to clear statement of a principle and its use). And, it seems to be effective when a person who asks for filing a patent application to those persons requests it based on a principle and its use, and for education in the persons who are newly engaged in application practice.

Moreover, according to Author’s theory, by abstracting, arranging, and accumulating the technology which is developed and acquired, they can be taken out as common intellectual asset and can be used for in-house education. Fur-

thermore, they would become a judgment data for determining a technical level in their company, and they also become determination data for comparison with the other company and for required technological introduction.

This paper, as the preface also described, tried to solve a problem, by abstracting (arranging) the fact itself, using “a principle and its use” and “a physical-object system and material type, and 6 factors”. The concept proposed in this paper is not necessarily adopted in practice, such as a judicial precedent and an examination guideline.

However, since these are based on the inner nature of an invention and its essence at all, it is considered that analyzing and arranging of technology and invention by using them are certainly effective. Rather, new knowledge may be acquired from there. For gentle readers, it would become one policy to speculate a case and consider a reason, and summarize explanation in lawsuit, trial and application examination etc. practically using the word which is appearing in regulation.

As mentioned first, this paper mainly concerns about Japanese Patent Law, and Japanese Patent and Utility Model Examination Guideline. However, inventions, especially technology/engineering are common all over the world. Additionally, norms regulating them are also recognized to be mostly common in the world. In this paper, therefore, Author tried to analyze technology and inventions so as that the explanation and fruits can be adapted and accepted all over the world. As a result, the understanding of problems of patents and the way of making inventions, etc. in this paper may be useful for practice in the world.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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