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The Physical-Object Invention and the Material Invention

—Efficient Use of a Categorization Based on Looks (Appearance and Property)

Kotaro Kageyama

Kageyama International Law & Patent Firm, Tokyo, Japan
Email: kageyama@kageyamalaw.com

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Abstract

As the way of the categorization of inventions from their appearances and properties, the physical-object invention focuses on the shape and structure of articles, and the material invention focuses on the property and its transformation of articles (the Opinion 1). The author has hitherto proposed the above categorization. In this paper, the ground of the introduction and reasonableness of introducing this categorization into the patent system will be explained in more detail. In addition, the property and its transformation in the material invention and the technical systematization of the contents of the definition of the physical-object/material inventions will be analyzed. The relation of an article and material can be represented by the words "An article comprises materials." The flow of technical development and formation of inventions will be also explained. The issues, which should be revised, relating to the existing patent examination guidelines and the interpretation of the theory of dividing invention into elements, will be analyzed, using the categorization of physical-object/material inventions. The reason why the PBP Claim can be applied only in the case of material inventions (only in the part of them) will be also shown. On the contrary, the reason why the relation to use other persons patent invention can be applied only in the case of physical-object inventions will be also explained. In this regard, the discussion will be made combining together the author's another opinion (the Opinion 2) placing the high value on the principle in the analysis of the formation process of inventions, especially in the case by means of experiments, also. Furthermore, the possibility of introducing the categorization of physical-object/material inventions in the way of making inventions will be discussed.

Keywords

Categorization (Classification) of Invention/Technology, Appearance or

Property of Invention, Property and Its Transformation, Theory of Dividing Invention into Elements, PBP Claims

1. Introduction

The author has hitherto studied such patent law problems as 1) a recognition of an inventor/joint inventor and a contribution ratio among joint inventors[1,2], 2) PBP (product-by-process) claims[3], 3) inventive step[4], and 4) construction of the technical scope of a patent invention[5], and so on, based on the categorization of an invention into a physical-object invention and a material invention (the Opinion 1) and the analysis of the formation process of an invention (the Opinion 2)[6]. (These two Opinions are major components of the "framework of my view." The Opinions 1 and 2 may be collectively referred to as "the Opinion" in this paper.)

In this paper, with regard to the physical-object/material invention (the Opinion 1), discussion is made regarding its grounds and features, and its reasonableness which can be considered when a patent is granted to the invention, and so on. Then, this paper discusses the legal meaning of the categorization of the physical-object/material invention. With this categorization, this paper discusses the usefulness to analyze such patent law problems as noted above. It further discusses the development of technology and enhancement of social utility from the point of view of the physical-object/material invention.

This paper focuses on the Opinion 1 and summarizes the author's arguments on such issues as noted in 1) through 4) above. In addition, based on the categorization of the physical-object/material invention, this paper argues on identification of an invention to suggest better examination guidelines for patent and utility model than ever.

The patent law system is very common throughout the world under the in-

[1]Kageyama (2010) Formation of Invention/Joint Invention and Recognition of Inventor/Joint Inventor. Journal of Intellectual Property Law and Practice (Oxford Journals), Vol. 5, No. 10, 699-712.

[2]Kageyama (2012) The Practice of Recognizing an Inventor/Joint Inventors and Calculation of Contribution Ratios among Joint Inventors. Journal of Intellectual Property Law and Practice (Oxford Journals), Vol. 7, No. 8, 590-603.

[3]Kageyama (2014) 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, URL (last checked 20 July 2017) http://www.scirp.org/journal/blr

[4]Kageyama (2016a) Determining Inventive Step or Nonobviousness for a Patent Requirement in View of the Formation Process of an Invention. Beijing Law Review, Vol. 7, No. 3, URL (last checked 20 July 2017). http://www.scirp.org/journal/blr

[5]Kageyama (2016b) Study of Technical Scope Including Doctrine of Equivalent and Patent Infringement Litigation. International Journal of Case Studies, Vol. 5, Issue 11, URL (last checked 20 July 2017) http://www.casestudiesjournal.com/volume-5-issue-11/

[6]As regards to the issues of 1) and 2) above, the author has written a book in English: Kageyama (2015) Recognition of Inventor/Joint Inventors and Product-by-Process Claims. Berlin, Germany: LAP LAMBERT Academic Publishing.

ternational treaties and conventions. Therefore, this paper mainly discusses the system in Japan but its content can also be applicable to other countries of the world.

2. Summary of Framework of the Author's View to Clarify the Invention

The author discussed the framework of his view in detail in the author's book cited in the footnote 6. His papers cited in the footnotes 1 to 5 also touch upon it. Therefore, a brief summary will suffice here.

2.1. Meaning of an Invention

An invention is "the highly advanced creation of technical ideasutilizing the laws of nature." (Japanese Patent Law, Article 2, Paragraph 1. Every patent law quoted in this paper is a Japanese one.) In the above, the laws of nature are natural laws, most typically, principles of physics and chemistry. A "utilization of the law of nature," a "technical idea" and a "creation" are acts. A technical idea is a kind of mental act. Therefore, anything that may lead to an invention can be considered as an act. With regard to the utilization of the law of nature, the law of nature (or natural principle) is an object of act (fact) and its utilization is an act.

For the "principle", a tentative one shall suffice here. Its scope should 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).

2.2. Categorization of an Invention (Physical-Object Invention and Material Invention) (the Opinion 1)

(1) Physical-object invention and material invention

An invention can be categorized into either a physical-object invention or a material invention. This categorization is performed based on the viewpoint judging from the way how it looks like, so to speak, the appearance or property of an invention.

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[7].

In the case of a physical-object invention, it is easy to perceive its principle or model from its appearance and so on, and the principle is often easy to under-

[7]A Japanese Lawyer, Jun Takahashi, stated: "As for the method of categorization of inventions, it is more appropriate to use the criteria of physical-object and material inventions as pointed out by Kageyama." (Takahashi (2014) Shokumu-hatsumei-kiteiHenkō-oyobiSōtō-rieki-santei-no Hōritsu-jitsumu (p. 51). Tokyo, Japan: Keizai SangyōChōsa-kai).

stand. Therefore, it is typically easy to apply to the formation process of an invention ((2.3), the Opinion 2). On the other hand, for a material invention, its principle is often unknown or difficult to understand, and in many cases, the invention is achieved through experiments.

Among the definitions of an invention discussed above, the categorization of the physical-object/material invention is based on the creation of a technical idea. Since the physical-object/material invention is a creation, discussion is made on its characteristic components (characteristic affairs in view of contribution to the effect of an invention or patentable affairs). Thus, the categorization of the physical-object/material invention fits with the statutory definition under the Japanese patent law and its application.

Further to Table 1, when relationship with the requirements for patent and the definition of an invention before are considered, it can be said that (A) amounts to an industrial applicability (Patent Law, Article 29, Paragraph 1), (B) amounts to a law of nature and (C) amounts to a creation of a technical idea respectively.

(2) Examples

① As an example, we consider a case of a very simple technology 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.

② Inventions in the mechanical fields and construction fields are often physical-object ones, whereas those in the chemistry fields are material inventions. In the electric fields, for instance, (i) inventions related to circuits and so on are physical-object inventions, whereas (ii) those that focus on the properties, such as semi-conductors and magnetic materials can be considered as material inven-

Table 1. Technical fields, principles and categorization of inventions based on physical-object/material types.

(A) Technical field (usage)	(B) Principle	(C) Categorization based on physical-object/material types
Building and civil engineering	Physics	Physical-object
Machine	Physics	Physical-object
Electric	Physics	Physical-object/material
Chemistry	Chemistry	Material
Medical and food	Chemistry	Material

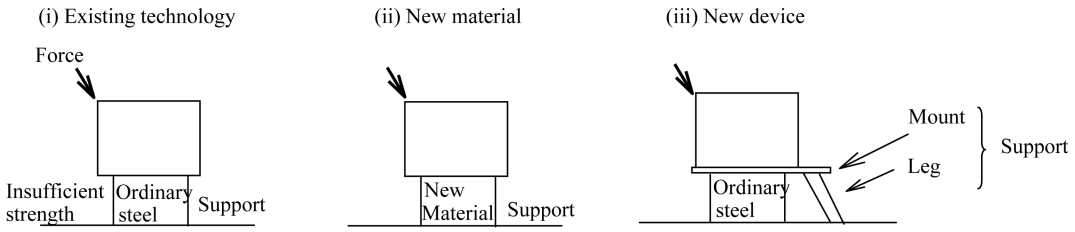


Figure 1. Invention of new material (material invention) and a new device (physical-object invention).

tions. The invention of the airplane described below can be considered basically as a physical-object invention in the mechanical field.

③ The categorization of the physical-object/material type is applicable to understand not only inventions (as a whole and in parts) but also technologies in general. The physical-object and material technology/invention can be used in combination mode, as some parts are physical-object types and other parts are material types within one article or system, as if it constitutes a mosaic structure.

④ Any "process", including a process for producing an article, is a way of viewing an invention in timeseries, so to speak, dynamically. It can be said that the process is a succession of each constituent step (process step). The physical-object/material type is, so to speak, a static way of viewing inventions. Each constituent step can be necessarily described as the physical-object/material type.

For the process of producing (manufacturing) a product, as shown in the **Figure 2**, one can think of a process step (or stage) for combining substances (physical-object), and a process step for generating transformation of the properties (material).

Among each process step, some are characteristic and others are not. In general, when there is a material process step, the properties will transform in that step. Therefore, such a process step is often considered as characteristic in a product manufacturing process.

The process is not for production but for a simple method of measuring and weighing, and so on. The physical-object/material type is applicable to each constituent step of the process.

2.3. Analysis of Formation Process of an Invention and Weighing Principles (the Opinion 2)[8]

(1) Formation Steps and Specific Examples

Using an example of inventing an airplane, we can consider as **Figure 3** (mainly physical-object type).

In the figure, [1] is a preliminary stage of [2]; each stage in [2] carries some recognizable originality (creativity).

Within the figure, from the definition of an invention given earlier, the following can be considered:

[8]For details on the formation process of an invention, in particular, one made through experiments, see the author's book p. 59-, which is cited in the footnote 6.

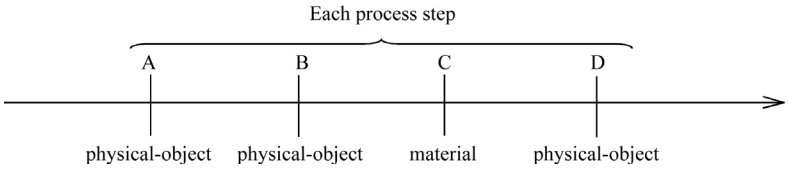


Figure 2. Each process step of an invention of the process for manufacturing a product.

[1] Purpose of an invention (the problem)	- want to make the apparatus to carry people for flying in the sky
[2] Formation process of an invention	
(A) Conception (proposal of*1)	
(i) Mere intuition	- make the apparatusthat has the structure like a bird
(ii)Conception based on a principle	- make an object float in the air using the air resistance by propelling it forward (generate a lifting force for an object using the 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*2	- conduct progressive experiments starting from (a) parts such as propellers and wings, to (b) a miniatureof 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) Completing by repeating (i) to (iii)	- something that is practically applicable/usable

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

*2 Generally speaking, experiments and calculations are conducted considering the parts to start with and then the whole, and also starting from the miniaturethen expanding to the full-sized object. Here, calculations include computer simulations.

Figure 3. Purpose of an invention and the formation process of an invention (the case of inventing the airplane).

As an invention is defined to be the creation of technical ideas, it is beyond question that the establishment of the model is most important in a patented invention, and the conception based on a principle is also important because an invention is a technical idea utilizing the laws of nature.

Therefore, the inventor is a person who has contributed to an establishment of a model or a conception based on a principle.

In this regard, the role of a principle is to endorse the "function" that is often referred to in court decisions and examination guidelines.

In the physical-object invention, the formation steps of an invention as mentioned above are typically applicable.

(2) Case of inventions that require experiments

A very large number of cases require experiments as a means of forming an invention. Almost all of the material inventions require experiments. The following will look into the formation process of an invention from this viewpoint.

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."An invention utilizes a law of na-

ture. This fact justifies an inclusion of the natural causal correlation, as mentioned above. In this case, a reproducible phenomenon can be used instead of a principle and 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 most correct 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, (B1) produces a good result as reproducible phenomenon (B2). (In Figure 4) At this point, one can say that an invention is completed.

The above process can be shown in time series in Figure 4.

① If the principle is difficult to understand, and when the invention is formed, the "tentative principle" (B_1) is distinguished from "experimental conditions or a product having an effect" (experimental results, B_2) and is sufficient to allow prediction of these, consideration of a tentative principle is 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 (for an invention of a method for producing a product) and obtaining a product having an effect (for an invention of a product) 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".

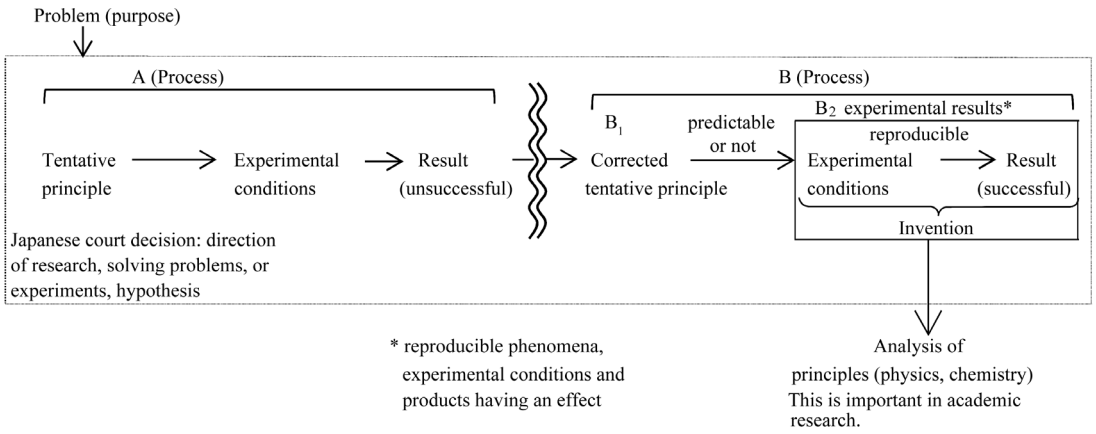


Figure 4. Processes where an invention is formed by experiments.

② However, presumably, it is likely that there are few cases of the tentative principle being sufficient to allow prediction of the experimental conditions and results. In such a case, the tentative principle is considered to remain only as "a mere intuition". Discovery and utilization of reproducible phenomena shall replace the conception based on a principle with reproducible phenomena. 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, 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.

It is likely that there are not a few cases where the tentative principle is not the true principle. The true principle often remains unclarified, and even if they are clarified, it is often achieved after the completion of the invention. Additionally, an easiness of experimental results may likely be influenced by the technical scope and prospects where a tentative principle is set.

③ There is also "the case where the principle is unknown (unclear)", compared with the case of "the principle is difficult to understand". In the former case, one cannot even think of a tentative principle.

④ 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, apparatus or an experiment formula, and so on.

It seems that the experiment in **Figure 3** [2] (B) (ii) shows just this case. When it is difficult to obtain desirable results through experiments or when there is a gap between a tentative principle and the true principle (in other words, when the invention is non-obvious), such fact may be one of the reliable evidence to show a high level of inventive step (see, (9.2) (1) ③ and ④).

Based on the above discussion, it is understood that when an invention is examined for a patent, it is necessary to consider whether it is a physical-object invention or material invention.

2.4. Example of an Invention by Experiments and a Tentative Principle (In the Case of JSR Protective Film Material, Tokyo District Court, Decided September 12, 2006)[9]

In the following, the author would like to have a discussion, for the purpose of understanding the Opinion, based on the above decision, with reference to "the invention formed by experiments" and "the tentative principle," which are the most difficult concepts to understand the Opinion 2especially.

(1) Decision

[9]See, X v. JSR K. K. (1985) HanreiJiho106; 1234 HanreiTimes182 (Tokyo District Ct., Sept. 12, 2006). The above case is for an employee invention. For details of analysis of text and how to write the judgment paper on this case, see the author's book, as cited in the footnote 6, at pages, 147, 202, 69 and 212.

① Company aim and the problem

In the manufacturing process of liquid crystal displays, there was the demand for improving the adherence between the protective film and the substrate.

② Establishment of a hypothesis

For improving adherence, it is necessary to develop a new polymer, but there were three stages (in which the increase of the thermal resistance is aimed by the copolymer of DCM (dicyclopentanylmethacrylate) and GMA (glycidylmethacrylate)), namely the establishment of the first hypothesis, the establishment of the second hypothesis, and then the application of a base polymer that satisfies the second hypothesis.

The first hypothesis is that "a heat treatment renders the film hardened and shrunk and that the film can be easily peeled off under a force which is concurrently generated and applied to the facial surface of a circuit board." The second hypothesis is that "the monomer, which has a property of good heat resistance and of less hardness and shrinkage under heat treatment at a high temperature, and less water-absorbance or non-hydrolysis, is copolymerized with GMA at an appropriate rate." The third stage is an evaluation with the copolymer using such an acrylate as DCM, which is in compliance with the second hypothesis.

③ The plaintiff also conducted experiments, through trial and error, to discover the most suitable base polymer, and as a result, he arrived at this invention.

④ Even if the amount of experiments actually conducted by the plaintiff was less than that of A or C (both are subordinates of the plaintiff), the plaintiff played a role of considerable degree in establishing the hypotheses and in determining the research direction at each stage.

⑤ Considering the above overall circumstances, the contribution ratio among the joint inventors—the plaintiff, A and C were estimated at 40%, 30% and 30% respectively.

(2) Discussion

① This case deals with the material invention to fall into the case shown at (2.3) (2) ①. The first hypothesis and the second hypothesis and so on are considered the tentative principle. It can be inferred that the tentative principle when the invention was formed, was sufficient to allow the prediction of the experimental conditions and products having an effect. Therefore, this tentative principle is considered a conception based on a principle. The "hypothesis" discussed above can be considered as a typical example of a tentative principle. Besides, "directions" of researches, problem-solutions and experiments, which are often referred to in court decisions, can be regarded as a tentative principle depending upon the way of being shown (see, **Figure 4**).

② With regard to the recognition of a joint inventor, see (8.1) below.

2.5. Viewpoint of the Opinion and Solution of Patent Law Problems Based on the Consideration of the Opinion 1

The reason why the Opinion is introduced is as follows. It is considered that the

reasonable method to clarify the content of an invention would be to analyze and examine it from (a) the looks (appearances, properties) of the invention, which is cognizable by human beings (so to speak, static viewpoint) and (b) the process by which an invention is formed because a human being is involved in its production (so to speak, dynamic viewpoint). The aforementioned (a) is the viewpoint suggested in the Opinion 1, and the aforementioned (b) is the viewpoint suggested in the Opinion 2.

The foregoing discussion seems to be suitable with the consideration of its present conditions (corresponding to the Opinion 1) and its history (corresponding to the Opinion 2) to comprehend the "society."

A principle that is one of the core pieces of the Opinion 2 is intangible and abstract. On the contrary, the categorization of the physical-object/material invention in the Opinion 1 can be perceived by using five sensory organs as being tangible and specific, because it comes out from "a model and experimental results (reproducible phenomenon, experimental conditions or a product having an affect)" which are embodiments of an invention. For this reason, it is easy to understand. The Opinion 1 is useful to analyze many patent law problems, because it provides some aspect to help understand the essence of an invention. The properties in the material type are more difficult to perceive by the five sensory organs compared with the structure of an article in the physical-object type, but it is not impossible. In comparison, the principle, which is in the abstract state, is impossible to perceive by the five sensory organs although it is conceptually understandable.

In this paper, the author elaborates on his consideration in the physical-object/material invention, and attempts to comprehensively elucidate several important questions by way of adding new ideas to the conventional arguments.

3. Ground for Thinking of the Categorization of the Physical-Object/Material Invention

Let us consider why it is reasonable to think of the physical-object/material type as the categorization of inventions.

3.1. In View of the Technical Meaning in Daily Life

The physical-objective/material invention is necessary and sufficient in their daily technical viewpoint as a way of categorization.

(1) Two sides of an "article"

There are two ways of looking at an "article": shape-oriented (the physical-object type) and nature- or content-oriented (the material type). Also there are two faces/factors (oraxes) to look at an article: the shape and the quality. The "shape" amounts to the structure and the "quality" amounts to the characteristics. Therefore, according to this rationale, only the structure and the characteristics are the parameters to identify an article. Namely, the structure and the characteristics are practically necessary and sufficient factors to identify an ar-

ticle. The physical-object type focuses on the structure while the material type focuses on the characteristics.

Thus, it can be induced that the physical-object/material type cover technologies and inventions of all kinds without exceptions.

(2) Flow of technical development and definition/content of the physical-object/material type

① In view of flow of technical development

An "article" is viewed from its shape or structure. To the contrary, a "material" is viewed from its properties since its position in the article is predetermined. The author describes it: "An article comprises materials." A material may have a wider application than in the original article. With regard to the relationship between the physical-object technology and the material technology, a flow shall take place as shown in (6.2) to illustrate the technical development and formation process of the physical-object/material invention.

This will lead us to believe that the categorization and criteria of the physical-object/material invention are continuous to each other, and can be considered to have practical reasonableness.

② In view of the definition and content of the physical-object/material type

As discussed in (4.3) (1) and shown in Table 2, it is conceivable that the cases where both the physical-object type focuses on the structure and the material type focuses on mechanical properties are close to each other in view of the physical-object type and material type definitions/contents. This is because mechanical properties are easy to understand from the structure of an article. In other words, although it is a comparison of the structure with the characteristics, as mentioned in the foregoing (1), it is considered that there is continuity between the physical-object type and the material type.

From the above, it is understood as follows. The physical-object and material types are inventions divided into two parts from the invention whose contents change continuously. Therefore, there is no other invention than the physical-object/material invention (it is possible that a portion of an article/system is physical-object type while the rest of the parts falls into material type), and such categorization is understood to be reasonable in a sense different from the foregoing (1).

③ The foregoing paragraph ① shows a flow of comprehensive technologies. With that background, the ② focuses on specific contents. They fit together.

(3) Relationship between the foregoing (1) and (2)

The paragraph (1) shows a way of seeing an article in abstract and conceptually. The paragraph (2) shows a concrete content. The conceptual way of looking at (1) has been hitherto acknowledged, as shown in the following (3.2), as being correct. Therefore, there is no contradiction between the approaches shown in the foregoing (1) and (2).

Both (1) and (2) show an appropriateness of the categorization of the physical-object/material invention from the viewpoint of daily technical perspective.

(4) In actuality, the distinction between the physical-object and material types can be made as follows.

A representative example of the physical-object invention is a mechanical invention and a typical material invention is a chemical invention. However, both types have a wider reach than the example above (see, (2.2) (1)). Therefore, the first thing to do is to determine whether the invention in question is mechanical or chemical. If it is mechanical, anassumption can be made that it is a physical-object invention, and *vice versa*. Then, the consideration has to be made concretely whether focus should be directed to the property of the characteristic parts of the invention, or to the transformation in its property. If these are items of focus, the invention can be categorized as the material invention.

If it is a combination of the physical-object and material type, its characteristic parts can be both in the physical-object type and the material type. When a need arises for further review, focal points shall be directed to specific characteristic parts.

3.2. Linguistic and Philosophical Meaning of an Article and Material, and Their Relationship

(1) An article occupying the space in the three dimensions of length, width and height is a material that can be perceptible. (in the dictionary "*Ko-ji-en*.")

This definition is suitable with the author's notion that an article comprises materials.

(2) *Eidos*and *hyle* in Aristotle' philosophy

Aristotle, an ancient Greek philosopher, presented the notion of a pair that a form is made with materials, opposing the concept of *eidos*to that of *hyle*. *Eidos* represents a shape and *hyle* represents a material.

3.3. Relationship with a Device under the Utility Model Law

The device under the utility model law is defined as a device "relating to the shape or structure of an article or combination of articles[10]." (Utility Model Law, Article 1)

The device, being common with the physical-object type, does not include the material type which focuses on properties and their transformation. The device does not include the process for production which is an essence of the material type also.

The rationale behind this is that the device, called a petit invention, has a clear-cut shape (outer appearance) of a creation. Further, it is a creation of technical ideas utilizing the law of nature but it is, different from the invention, not required to be highly advanced. (See on the invention in the foregoing (2.1))

[10]The examination guidelines for patent and utility model (hereinafter called "the examination guidelines") exemplify (a) a device pertaining to a composition, (b) a device pertaining to a chemical compound and (c) an article that does not process a certain shape, in addition to a device that falls in the category of process, as a non-statutory device, which does not correspond to a shape, a structure of an article or a combination thereof. The devices (a) to (c) are all in the material type. Under the utility model law, a combination means an indispensable one like the bolt and nut. The combination in the physical-object type has a broader meaning.

Historically and technologically, the technology/invention in the physical-object type is more comprehensible than the technology/invention in the material type.

When the essence of an invention resides in a process for production, it would be the case of an invention of a new material in the material type. Simply stated, an article cannot be produced in the absence of knowledge to produce it. Almost all of the material invention is formed through experiments. In that case, the process for production is critically important.

Under the patent law, a product that is identical with the product shall be presumed to have been produced by the same process for the product, so far as the product is new (Patent Act, Art. 104). It pays attention to the process of production.

3.4. Legislative History

Initially, a patent was granted to a physical-object invention in each country. Then, coverage was gradually expanded to a material invention as the chemical industry developed. For more details, see (6.1).

Thus, the categorization of the physical-object/material invention is reasonable as it is suitable with the history of the patent system[11].

[11]Relationship with the inventive principle of TRIZ

The term TRIZ is an acronym for a Russian phrase meaning the "Theory of Inventive Problems Solving." It was established in 1946 by *GenrichAltshuller* who was a patent examiner of the former Soviet Union. He established it as the "scientific theory to form an invention" based on the analysis of a huge amount of patented inventions published in the past.

In summary, his theory consists of the following explanation and **Figure 5**.

A: According to the methodology of TRIZ, an invention can be produced in the following reasonable procedures.

Namely, ① a technical "contradiction matrix" is formed to solve a specific problem using 39 general parameters (such as weight, strength, reliability, etc.); ② the specific problem is generalized to find out a to-be-solved contradiction in the contraction matrix (parameter of the foregoing ① and their relationship); ③ "Inventive principles" prepared in the contradiction matrix (four out of forty, for instance) are chosen for use; and ④ to find out a specific solution.

B: In comparison, conventional methodologies repeat trials and errors as shown in the dot line.

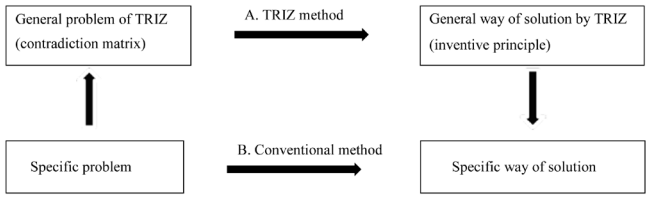


Figure 5. The methodology of TRIZ and conventional methodology for forming inventions.

TRIZ was developed with cooperation from supporters. After the collapse of the Soviet Union, it spread over the western nations. Now it has been adopted and used in practice by some of themajor manufacturing companies including Japanese ones in the world.

The above-mentioned inventive principle in TRIZ corresponds to the definition of the physical-object/material invention. The physical-object/material invention is essentially based on the "principle and the way of its utilization." This categorization corresponds to and is common with the 40 inventive principles in TRIZ. This fact witnesses that the categorization of physical-object/material type is appropriate.

Out of publications on TRIZ, there is an article by Darrel Mann: Mann (2002). Hands-on Systematic Innovation. Belgium CREAX Press (present publisher (2014) UK: IFR Press).

4. Features of the Physical-Object Invention and the Material Invention, and Meanings of Property and Its Transformation in the Material Invention

4.1. Features of the Formation Process of the Physical-Object/Material Invention

(1) Physical-object invention

In the physical-object invention, a principle and a model are distinguishable because they can be perceived from their appearances by using the five sensory organs and the principle is, in many cases, easy to think of. Therefore, the stages of forming an invention as discussed in the foregoing (2.3) (1) are typically applicable. Effects are also easy to predict.

(2) Material invention

In the material invention, a principle is unknown or hard to know. For this reason, experiments are required to form an invention in many occasions. There are two situations: a) a tentative principle allows the prediction of experimental conditions and a product having an effect to some extent; and b) a tentative principle provides no insights for such prediction. The latter situation is more frequent than the former. In this occasion, the principle is replaced with a reproducible phenomenon and the establishment of a model (*i.e.*, experimental conditions and a product having an effect) appears concurrently. The reproducible phenomenon and the model become integrated, thereby eliminating distinction between the two.

Because of the differences in technical nature as mentioned above, the physical-object invention and the material invention have significant differences in legal meanings.

4.2. Study of the Meaning of Property and Its Transformation in the Material Invention

As for the properties of an article that need to be the focus in the case of amaterial invention, their looks (their appearances and properties) can be described in Figure 6 using an example of a very simple invention:

In Invention (A), both the metal and the wooden board that are its component are physical-objects type, and as an invention, it is a physical-object invention. On the other hand, in the case of Inventions (B), (C) and (D), the metal is physical object type but all of rubber, alcohol and air are materials whose properties are of interest, and hence relate to material types. The rubber is considered as a compound, the alcohol is a solution, and the air is mixture of oxygen and nitrogen. As the invention, Invention (B) is a material invention, and invention (C) also is most likely a material invention, while Invention (D) may be a physical-object invention if the effect of the air is not so significant (or characteristic).

As seen in the above, there are differences among Inventions (B), (C) and (D) that resulted from their looks because of the differences in how rubber, alcohol, and air are derived. That is, rubber is produced by human as a compound (it

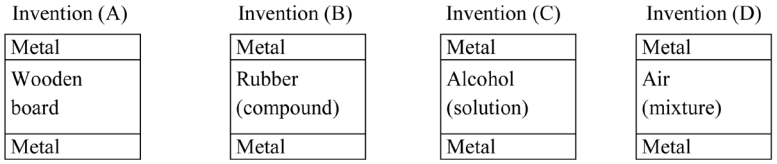


Figure 6. Physical-object/material invention derived from the properties of the material that constitute those inventions.

does not exist in the natural world), while it is easy to make an alcoholic solution, and air exists in abundance in nature.

4.3. Technical Systematization of Content of Definition in the Physical-Object/Material Invention

(1) Table 2 shows the content of definition of the physical-object/material invention, and shows its specific examples, together with physical and chemical principles that endorse them, and so on. It attempts a provisional technical systematization of the physical-object/material invention (it may be called a framework). In the table, the content of definitions is arranged from characteristic items of the physical-object type (upper) to those of the material type (lower).

Table 2 shows the typical feature of the physical-object invention in the order of: [combination] > [shape] > [structure], wherein the symbol > shows that the items on the left side are clearer than those on the right-side, because a combination of articles and their shapes are clear from their appearances compared with the structure. It seems that the feature of the material invention is shown in the order of: (a) [chemical properties] > [physical properties] and (b) [transformation in chemical properties] > [that in properties in general]. With regard to the (a) above, the physical property can be easily predictable from the structure of the article compared with the chemical property because such property is common to the principles in the physical-object invention. With regard to the (b) above, such transformation in chemical properties as being chemical reactions is characteristic of transformation in properties. As for both (a) and (b), transformation in properties can be regarded as more characteristic in general than the property per se in the material invention, because such transformation are unlikely in the physical-object invention. To sum up, the most characteristic example of the material invention takes place when a focus is placed on the chemical reaction as shown in the bottom line in Table 2.

(2) The following Figure 7 explains in order about the property transformation that is characteristic especially of material inventions in Table 2, from the situation where it is produced, because the influence of the production is significant. Simply stated, Figure 7 allocates what are shown in Table 2 to show transformation in properties (F and G) in the material invention based on the mode of its formation. However, in Table 2, the bottom portion shows features of the material invention while, in Figure 7, the upper portion shows features of the material invention to clearly elucidate it.

When two or more substances generate a compound through a chemical reac-

Table 2. Definition and principle of the physical-object/material invention and ways of invention.

Analysis of invention	Physical-object /material invention	From Definition		Example	Physical/chemical principle and its example		seeds[*1] →to cause function →solution		needs
evaluation[*7] ↑ to utilize a principle to increase evaluation ↑ with inventive step = invention = wey of invention	Physical-object type	A. Combination			Physics	Relation among elements	physical-object technology	Principle and way of its utilization	Corporate purpose
		B. Shape			Physics				Research theme
		C. Structure[*3]			Physics				Assignments (Problems to be solved)
	Material type	Property	D. Physical (mechanical)[*3]	strength, density (specific gravity), elasticity, grainsize, viscosity, coefficient of friction, heat conductivity, coefficient of thermal expansion	Physics: Newtonian mechanics, Hooke's law, Bernoulli's principle	Constants of property, Relation among constants	material technology		Think out of defects in conventional technologies[*2]
			(electrical)	electric conductivity (insulation), magnetic property	Physics: Ohm's law, Joule's law				
			E. Chemical	composition, molecular weight, melting point, boiling point, pH	Chemistry: acid/base, ionization				
		Transformation of property	F. property in general[*4]	transformation of the state (vaporization, liquefaction, solidification), hydration, suspension, crystallization	Chemistry: transformation in phases[*6], dissolution, diffusion	Transformation in material and states			
			G. Chemical	chemical reaction	Chemistry: neutralization, oxidation-reduction, catalysis				

[*1]Engineers utilize seeds (a stock of engineering), generate functions to seek (a principle and the way of its utilization) and attempt to solve a problem. [*2]Among others, research themes and assignments (problems to be solved) are proposed for the solution of defects of the conventional technology. [*3]The case focusing on the structure of an article and that focusing on the mechanical property are close to each other. The mechanical property can be easily understood from the structure in view of the principle. Also per-ceptions by the five sensory organs are easy in case of the shape. However, they are difficult in the structure in some cases and more difficult in the mechanical property. [*4]As to the case cited as an example, there are occasions showing features of the material type or less important transformation in properties. See, (4.3) (2) in this regard. [*5]Suspension means dissolution of solid particles into a liquid. [*6]This is a phenomenon where positions of molecules and atoms are changed and where structures are changed. Changes include transformation between gas, liquid and solid (three states) and between crystalline and non-crystalline (amorphous). [*7]See, (9.1).

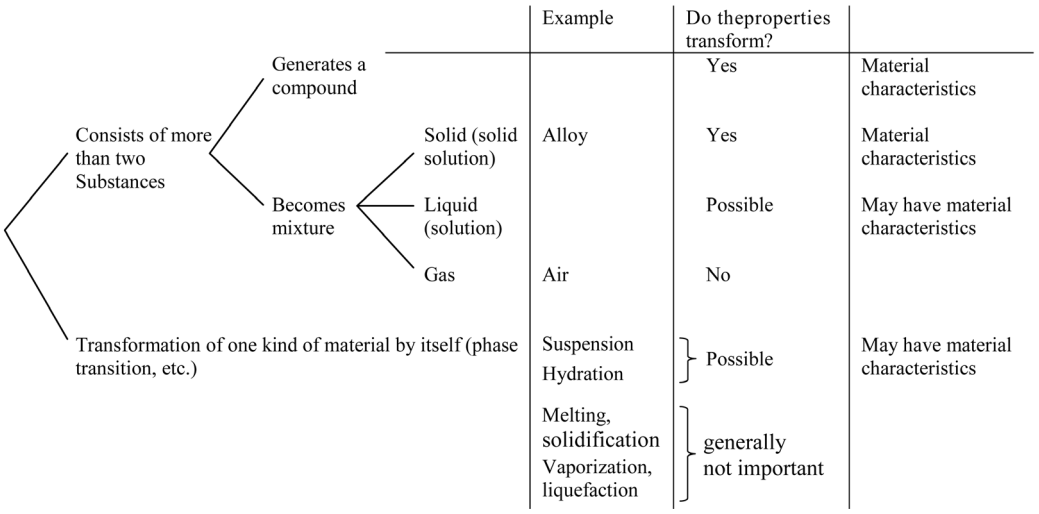


Figure 7. Properties and their transformation, and material characteristics or not.

tion, the property transformation is important and it shows the strongest characteristics of material inventions, where the nature of an article is more focused on. When two or more substances form a mixture, in the case of solid solution, the property transformation is important, showing characteristics of material inventions, whereas in the case of liquid solution, whether it shows characteristics of a material invention or not depends on the state of the property transformation. A mixture of gases is generally understood not to generate property transformation. For suspension, hydration, and so on, of only one kind of substance, it is determined depending on the state of the property transformation. This state of transformation depends on the nature and the degree of transformation, but in the end, it is determined by the degree of influence it has on the effect of the invention (when the influence is significant, it presents characteristics of material inventions). In the melting/solidification and vaporization/liquefaction of a material, transformations in their properties are generally considered not to be important. However, depending on the mode of use of each material, effects of transformation in the property of the material invention should be taken into account.

Generally speaking, the upper portion in Figure 7 which straight-forwardly shows features of the material invention, namely the case of a creation of a compound and a solid solution can be said more creative. These things are hard to exist in nature.

A point to distinguish the material invention from the physical-object invention is to decide whether a used product draws an attention to its shape, structure and combination (the physical-object invention) or whether it draws an attention to its properties and their transformation (the material invention).

5. Reasonableness of Considering the Physical-Object/Material Type in Patenting an Invention

In the foregoing (2.3), discussion is made with regard to the feature of process of

an invention formation. In the physical-object invention, the principle and the model are distinguishable, and the shape and the structure (in other words, the outer edge of an invention, see p.25(1)) come out in the model. This makes it easy to identify an invention and determine the scope of rights. However, it is difficult in the material invention. Thus, in this respect, inventions can be categorized into two types.

5.1. Relationship between the Physical-Object/Material Type and Engineering, Invention, Patent and Social Economic Life

(1) In patenting an invention, the science and technology should be taken into account but not the field where the engineering is industrially usable.

The engineering is born and an invention is made based on science and technology. An invention that meets certain requirements is to be granted a patent for use in the industry to contribute to the development of society. Their relationship can be depicted in the way shown in Figure 8.

In Figure 8, studies on the stage [c] and [d] (the stages to patent an invention) should start from the stages [b] and [a], a base of the stage [b], but not the stage [e]. This is because the stages [b] and [a] can be tied with principles and their utilization more directly than the stage [e]. For a specific example in this regard, see (5.4) and (7.1) (1) below.

Therefore, in order to identify a patent invention and determine the scope of rights, it would be more reasonable to use the engineering, science and technology, and the categorization of the physical-object/materialtype that is based on the principle and its utilization than the classification of industrial/engineering field, as detailed in the (4.3)[12]. With regard to a corresponding relationship between the engineering field and the physical-object/material type in rough terms, see Table 1. Needless to say, the above-mentioned classification of industrial/engineering field is not legal but is easy to understand and useful in view of the social economic life and engineering standpoint. Furthermore, the application of the above fields prior to the implementation of the physical-object/material type would be of reference for the review and consideration of the physical-object/material type.

(2) An invention is born from engineering. Through the identification of an invention and determination of the scope of rights, the invention is granted a patent for use in the social economic life when it meets requirements of patentability (such as industrial applicability, novelty and inventive step, etc.) Figure 9 illustrates the features in the flow of the physical-object/material invention and

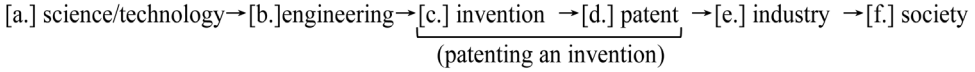


Figure 8. Engineering, science/technology and industrial use in view of patenting an invention.

[12]This does not necessarily deny the classification based on other aspects (for example, function) while the categorization of the physical-object/material based on the structure and characteristics of an invention (a product) seems most reasonable in classifying the invention.

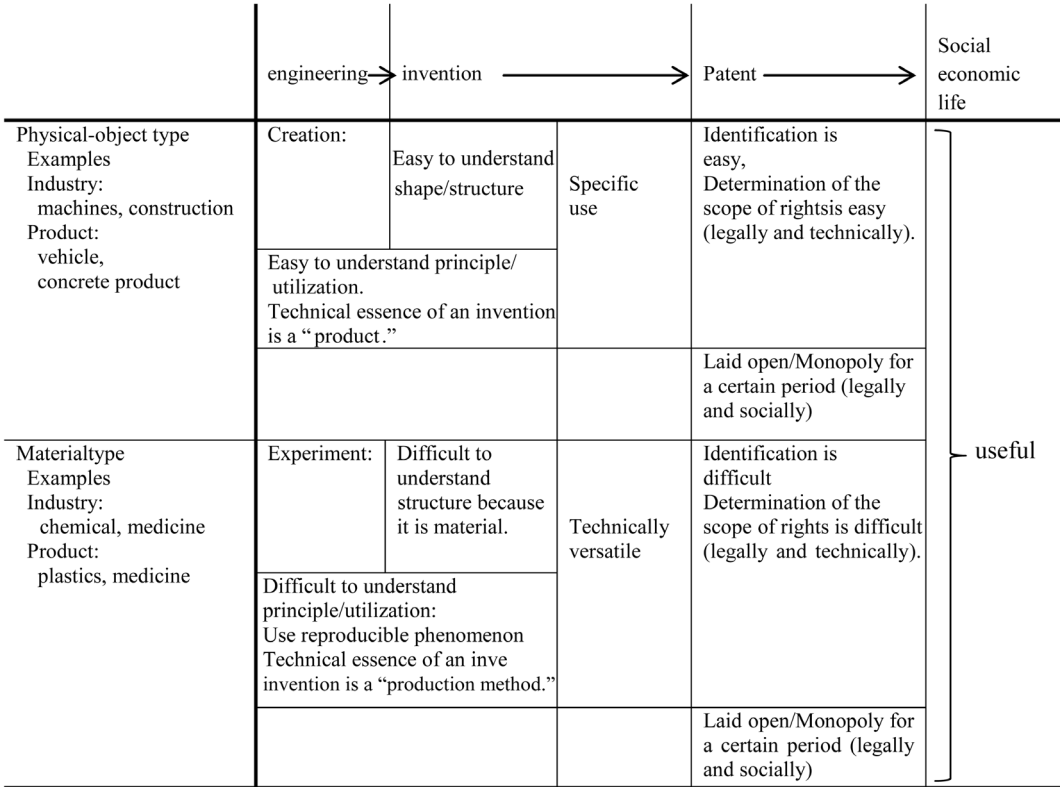


Figure 9. Relationship between the physical-object/material type, and engineering, invention, patent and social economic life.

the upper process until engineering is utilized in the social economic life.

As noted above, both the physical-object invention and the material invention contribute to the benefit of the social economic life, so they have to be protected under the patent system. However, it is often difficult to identify an invention and determine the scope of rights in the material invention. (Generally speaking, even a description of an invention in the material type is difficult.

5.2. Objects and Acts to Be Considered in Patenting an Invention and Enforcing a Patented Invention

In patenting an invention and enforcing a patent right, consideration has to be made on, among those listed in the foregoing (5.1) (2), identification of an invention, finding of the gist, judgment of novelty, judgment of inventive step (compared with novelty, inventive step is difficult in judgment. So, this paper focuses on the inventive issue) and judgment of infringement. For such consideration, Table 3 summarizes its object and acts, and whether a judged thing is object/acts itself or their comparison.

In the above, the object of [a_2], [b] and [c] is the gist. In this paper, however, including the object of [d], they are collectively described as the scope of rights (scope of protection or technical scope) also. This is because these parameters are common for the argument of the physical-object/material type.

To be more specific, identification of an invention and finding of the gist are

Table 3. Identification of an invention/finding of the gist, inventive step and infringement of a right, and objects/acts thereof.

	[a.] Identification of an invention, Finding of the gist[*1]		[b.] Determination of novelty[*1]	[c.] Determination of inventive step[*1]	[d.] Presence or not of infringement
	[a_1.] Identification of an invention	[a_2.] Finding of the gist			
Object	Matters to specify the invention	Gist	Gist	Gist	Scope of rights
Act	(Identification[*2])	(Finding[*2])		Act of conceiving (easiness in conception)	Injunction of infringement
Comparison or not	No comparison		Comparison	Comparison	Comparison

[*1]With regard to the PBP claim, [b] and [c] should be clearly distinguished from [a]. See, (8.4) (1) ② (b) (iv). [*2]A person who identifies an invention is the applicant while it is the Patent Office who finds its gist.

directed only to the relevant object and act. In the physical-object invention, the principle and the model are distinguishable. Identification of an invention and finding of the gist are easy to handle in the physical-object invention while they are difficult in the material invention because the principle and model come out in an integrated manner. This phenomenon happens frequently in the material type. However there are some cases of exceptions. They are cases where a tentative principle can predict certain experimental results, and it may not come out with the experimental results integrally. In such a case, identification of an invention, finding of the gist and determination of the scope of rights may be easy.

An inventive step is judged in view of easiness of a conception (or act of conceiving) after the comparison of the gist of invention with prior art. Infringement is determined after having construed and determined the scope of rights and compared it with a suspected infringing technology. A question of whether there is an inventive step and infringement is judged with respect to acts, based on the comparison of two technologies. In this judgment, the technical content (object) for comparison is the gist of invention and the scope of rights.

As noted above, it is easy to find or determine them in the physical-object invention while it is difficult in the material invention.

5.3. Conclusion on Reasonableness of the Physical-Object/Material Categorization and Supplements

(1) The categorization of the physical-object/material invention, as discussed in the foregoing (5.1) (2) and (5.2), is connected to the object and the act (effects) for identification of an invention, finding of the gist, determination of inventive step and determination of infringement.

In this sense, the categorization of the physical-object/material invention can be a classification that is linked to legal effects and meanings. It is also legally applicable.

Therefore, the categorization of the physical-object/material invention offers a reasonable criterion that is worth considering in patenting an invention and enforcing a patented invention.

(2) In the social economic life, an invention is satisfactory if it is useful as a product or method. It does not matter whether it is a physical-object invention or material invention. From the standpoint of research and development, such categorization may not be a concern for researchers because they are inclined to the development of products of social utility. They will not question whether the essence of a technology as discussed in the foregoing (3.3) is a product or process for production.

In this sense, the categorization of the physical-object/material type is a concept that can be useful when an invention is examined for the purpose of patenting. In other words, it is a hidden, unseen concept in the social economic life and in the phase of science and technology. Such concept is taken out in view of legal reasonableness and besides, necessity to identify an invention and to clarify the scope of rights.

(3) As technology develops, new materials are used in many occasions. These materials are material type. With the study of these materials for identification of the material and determination of the scope of rights, the examination guidelines shall be modified to make them more reasonable. The categorization of the physical-object/material invention, which has not so far been employed, can be supposed to provide a reliable viewpoint for such purpose.

In legal terms, the physical-object/material types bring out unusual features for the purpose of identifying an invention and determining the scope of rights (technical scope) which is the premise to cause the right and duty. Consequently, they result in different legal effects. Further study is necessary focusing on this point.

Conventionally, legal people argued about protection after a patent was granted. On the other hand, while spending their enormous human and technical energies toward research and development, scientists and engineers were not enthusiastic about arguing the issue of identification of invention and determination of the scope of rights, given the fact that they play a role of an interface between law (patent) and engineering (invention).

(4) Application of the categorization of the physical-object/material type to patent law issues and review of its usefulness are discussed in Sections 6 and 7 before.

5.4. Categorization Other than the Physical-Object/Material Invention—Mechanical and Chemical Inventions, and Others

Mechanical inventions and chemical inventions are a categorization based on the classification of the field of industrial application of technologies[13].

Certainly, the mechanical invention is the representative physical-object type while the chemical invention is the typical material type. Therefore, as an image of example, it would be all right to think of a mechanical invention as a physi-

[13]Academically, the mechanical type is referred to as mechanical technology while the chemical type is referred to as applied chemistry, that is a bit away from industrial application.

cal-object invention and a chemical invention as a material invention. For further analysis, however, it should be kept in mind whether the parts to be analyzed are focused on shapes/structures or properties/their transformation.

For example, an automobile engine is industrially a mechanical device. The structure such as a cylinder, a piston and a cam is the physical-object type but materials of the cylinder are the material type. Furthermore, engineering for the construction industry are physical-object type as the structure is important. However, when materials of concrete are at issue, they are material type. As shown in these examples, the physical-object/material technologies are often used in mixed combination.

It is clear that connection between the physical-object/material type and the principle and its utilization is close when compared with the mechanical/chemical type. Therefore, the categorization of physical-object/material invention is more reasonable. There are technologies that do not fall within the mechanical/chemical type but the physical-object/material type may include all types of technologies without exception, as mentioned in the foregoing (3.1) (1). In this respect also, the categorization of the physical-object/material invention is more reasonable.

Occasionally, industrial and technical fields such as construction (civil engineering/architecture), machinery, electricity, chemistry and medicines/foods are used for classification. The International Classification[14] basically adopts this classification system. In this case, there are certain fields that are difficult to include in the existing classification. Business field is a good example. To make it precise, this field should be classified as "Others" in the industrial classification system.

Also, the categorization of control/non-control systems may be conceivable as an example of other classification system than the physical-object/material type[15].

5.5. Compliance and Affinity with the Current Patent Law

Historically, a patent invention was directed to the physical-object. The material invention was added later. It can be learned from this history that the basic system of the patent law conforms to the physical-object invention. Here, we have to think about whether the patent law (including the examination guidelines) is likewise applicable to the material inventions keeping eyes on its difference from the physical-object invention. A typical example where a question of conformity

[14]This classification was prepared for the purpose of practical retrievals for patent searches and applications. It is based on the industrial application of technologies fundamentally, but depending on fields, it includes entries closer to the principle and its utilization in lower sections of the classification. From this viewpoint, it is rather comprehensive.

[15]With regard to the development of technology, (a) following the creation of a new product, (b) a new material is introduced into the product as a constituent and (c) one of the major flows of technical developments is the control of functions to the product by computers. Needless to say, performance of computers was due to the development of constituent materials like a semiconductor which is a material invention. Sentence (b) presents a view on the structure of the product that (c) presents a view of the function of the product.

with the patent law takes place is the PBP claim. This issue is discussed in (8.4).

In this connection, it is questionable whether the categorization of the control system/non-control system conforms to the current system of the patent law.

6. History, Development of Technology and Formation Process of the Physical-Object/Material Invention

6.1. History of Patent Invention

Historically, initially a patent invention was a mechanical invention (which was a representative example of the physical-object invention). (A good example is the patent on the steam engine which was granted to James Watt in 1769.)

As the chemical industry developed, material invention tended to be used in social life, thus causing a necessity of protecting it. As a result, in 1793, chemical substances (which were typical examples of material invention) were admitted as being patentable.

Later, many countries began to grant the patent on materials. In 1976 and onward in Japan, patent applications for foods and drinks, medicines and chemical substances were accepted for material patent. Prior to that change, the reasons for denial of the material patent were: security of civil life for foods and drinks; security of civil life/protection of domestic industry for medicines, and protection of domestic industry for chemical substances. Needless to say, inventions for these products fall within material invention.

At present, some of the developing countries do not allow patent for inventions of medicines, foods and drinks and chemical substances.

As discussed above, the categorization of the physical-object invention is in conformity with the history of the patent system.

6.2. Development of Technology and Flow of Formation of an Invention in View of the Physical-Object/Material Type

The above may be shown as follows to outline the history.

① First, invention of a new product that had been in demand for social economic life was made.

② Then, new material of good quality (*i.e.*, strong, light, easy to handle or less expensive) was developed as a constituent of the product in order to improve its utility (function and effect), and the invention was made. ("An article comprises materials.") A new material is likely also to expand its application from parts to the entire portion of the product.

③ Apart from the product, the material can be utilized with a newly developed way of use, thereby allowing versatile use of the material technically and socially.

④ Furthermore, a new product is invented using the material.

⑤ The steps ① to ④ above are repeated to develop technology and to progress society.

A concept of the above can be shown in **Figure 10**[15].

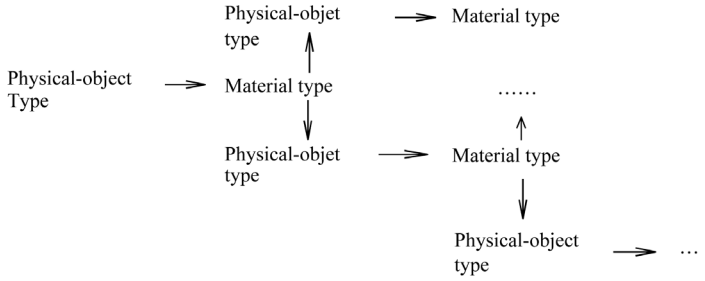


Figure 10. Development of the physical-object/material technology and formation of an invention.

The above can be easy to understand when considered with an example of an automobile and its technological development. For simplicity, it can be stated as follows.

The automobile was invented (a physical-object invention) as a means of transportation. The basic structure has remained unchanged since then. Along with the development of components (material inventions), the function of the automobile has been enhanced, and a control system for driving has been developed. The control system is basically based on the development of semiconductors and other devices (material inventions). The materials developed for use in the automobile are now being used in other products, for example, in airplanes.

7. Utility of Consideration of the Physical-Object/Material Invention (1)—Outline of an Invention and Its Formation

7.1. To Grasp the Outline of an Invention

The categorization of the physical-object/material invention helps grasp the essence of an invention, and extract the characteristic elements and a principle or tentative principle of an invention. It can be a starting point to tackle various problems concerning the invention and patent law because it may give insights for ways of describing the specification and the patent claim.

(1) Helping grasp the essence of an invention unlike the classification based on industrial application of technology

The categorization of the physical-object/material invention is endorsed by the principle of an invention and its utilization of an invention. It does not cause a mistake or error in grasping the essence of an invention. In the case relating to the photoelectric surface of X-ray tubes, oxygen is introduced to cause the transformation in properties in the process of manufacturing the photoelectric surface. The timing of such introduction of oxygen was a feature of the invention. The Intellectual Property High Court categorized this as a case to be classified in the "chemical field" (decided February 21, 2008)[16]. However, according to

[16]X v. K. K. Tōshiba (2008) (Intellectual Property High Ct., Feb. 21, 2008), Chiteki Zaisan Saibanreishū, Japanese Supreme Court website, (last checked 20 July 2017) http://www.courts.go.jp/app/hanrei_jp/search7.

the International Patent Classification (see Footnote 14), the X-ray tube is classified as an item in the "electricity" section. It would be appropriate for the court to consider the case of the "material invention."

Thus, in order to solve the parts that were the problem on the technology/invention, the first look should be directed to whether they are the physical-object type or material type. Such an approach would help grasp the technology/invention in the following procedures. In the case wherein the patent relating to the method for manufacturing a medicine of fine-grained core was questioned, the Tokyo District Court referred to the "field of this case" in the context of whether the invention was mechanical or chemical (decided August 27, 2002)[17]. However, the explanation cannot be understood. Actually, the invention used a mechanical method but it focused on the transformation of physical (mechanical) properties (see **Table 2**). So, correctly, this case should be regarded as a material invention.

(2) Putting the characteristic elements of a patent invention in order and helping extract the principle/tentative principle

With regard to a completed patent invention, if the categorization of physical-object/material type is considered starting from the scope of a patent claim and detailed description of the invention, it helps put characteristic elements of a patent invention (patentable features) in order and extract them appropriately.

If it is a physical-object invention, it is not only the model (or effect) but also the principle of an invention can be understood. To the contrary, if it is a material invention requiring experiments, we can have a progression to analyze the questions of whether such factors as products having an effect, experimental conditions to obtain them and a reproducible phenomenon can be distinguished from the tentative principle, whether the experimental results can be predicted from the tentative principle and the extent of difficulty of the prediction.

7.2. Relationship with the Examination Guidelines for Identification of the Invention

(1) The physical-object invention shows a clear outer boundary but the material invention does not. So identification of an invention is difficult in the case of material invention.—Characteristics of the physical-object/material invention as the premise

In the physical-object invention, a physical "structure" is clearly known, thus revealing a clear outer boundary. In comparison, the material invention does not necessarily show a chemical "structure" of the invention. In some cases, "characteristics" replacing it are also unclear. At least, identification of an invention by the characteristics is not clear enough compared with the identification by the structure. In other words, characteristics (or properties) are a concept having an extent (for example, viscosity is a matter of presence as well as its degree). For

[17]TejimaKikuo & Pfizer Seiyaku (1810). HanreiJihō 102; 1117 Hanrei Times 280 (Tokyo District Ct., Aug. 27, 2002).

this reason, the outer boundary of the invention tends to be unclear. When transformation in property is considered, unclearness increases further.

On the other hand, in the physical-object invention, its state of use (for example, purpose) can be identified. Comparatively, in the physical-object invention, constituent materials enable many states of use (it is versatile or has a potentiality of future development, see, **Figure 10**). As a result, there is a possibility that a plural number of inventions can be formed and that one invention may need many embodiments to explain. Otherwise, identification of an invention may not be sufficient in some cases.

(2) Study of examination guidelines based on the discussion on the categorization of the physical-object/material invention—General remarks

As discussed in the foregoing (2.3) (2), there are many occasions in the material invention where an invention can be formed by experiments and a tentative principle is not enough to predict the product having an effect, and so on. In this case, the principle and the model come out integrally, so that it is hard to comprehend its structure.

In Japan, the examination guidelines were modified to make them concise and clear for "international harmonization" in September, 2015. The modified version indicates a "technical field where it is difficult to predict the structure of a product from its function/characteristics." (The former examination guidelines indicated a "chemical substance" as an example.) It is clear from the above that this is common with the material invention in its majority. The material invention is hard to use its structure as a determiner (the object to be determined). It is not reasonable to use "prediction" (subjective) as a determiner for the determination of the structure.

As a conclusion, the determiner to be used shall be properties and their transformation which are objective facts. It shall not be a subjective thing.

(3) The examination guidelines relating to the requirement of description for the specification and patent claims—Specific remarks

① Enablement requirement[18]

"When the claimed invention pertains to a technical field where it is difficult to predict the structure of a product from its function/characteristics, and a person skilled in the art cannot understand, even though the statements in the description and drawings as well as the common general knowledge at the time of filing are taken into account, how to make the product defined by its function/characteristic, the statement in the description fails to comply with the enablement requirement, except for products, manufacturing methods of which are concretely stated in the description."

"When an invention pertains to a technical field, such as chemical compounds, where it is relatively difficult to understand how to make and use a product on the basis of their structures or names, normally, one or more repre-

[18]This is the requirement that the statement in the description must be so clear and sufficient in such a manner as to enable a person skilled in the art work the invention.

sentative examples are necessary for the description to be stated such that a person skilled in the art can carry out the invention."

These show specifically the extent of the explanation of the detailed description of the invention because it is unclear in the material invention when compared with the physical-object invention, how an invention is produced or used only from matters to specify the invention. Therefore, the "difficult technical field" is not limited to technical fields relating to chemical substances.

② Support requirements[19]

"The maximum extent to which the claimed invention may be expanded or generalized without going beyond the extent of disclosure in the description depends on technical fields to which the invention pertains. For example, compared with in the technical field where it is difficult to understand the correspondence between function/characteristics of a product and structure of the product, in the technical field where it is relatively easy to understand such correspondence, the maximum extent to which the invention may be expand or generalized based on the specific examples tends to be wider."

A degree of expansion or generalization is divided into the technical field where it is difficult to understand the correspondence between function/characteristics and structure, and the technical field where it is relatively easy to understand it. This corresponds exactly to the categorization of the physical-object/material type. This is because the outer boundary of an invention is clearly recognizable in the physical-object type.

③ Clarity requirements

"Even when an invention of a product pertains to a technical field where it is difficult to predict the structure of the product from the function/characteristics of the product, what has the relevant function/characteristics may be clearly understood by considering the common general knowledge as of the filing. In such case, the matter specified by the relevant function/characteristics is deemed to be sufficiently specified from a technical perspective."

In this regard, the "difficult technical field" was explained in the former examination guidelines as "It should be noted that there are many cases where the scope of an invention is ambiguous (for example, chemical substance invention)." This implies a presumption that the examination guidelines had the material invention in mind.

Therefore, it would be better to use the criterion of whether it is a material invention or not in order to determine whether the scope of an invention is clear or not.

(4) Relationship with the examination guidelines—Conclusion and supplements

Regarding the examination guidelines for enablement requirements, support requirements and clarity requirements, the categorization of the physical-object/material invention is more appropriate than "whether it is difficult to predict the

[19]This is the requirement that a claimed invention shall be disclosed in the description.

structure of a product from its function/characteristics."

One of the reasons that makes the examination guidelines hard to understand is that they were prepared based on the physical-object invention, thereby regarding the material invention as being exceptional. Essentially, a drastic measure is necessary to equally treat the material invention with the physical-object invention. However, viewing each requirement of description in cross-section in view of the characteristic of the material invention, the current examination guidelines may at least assure more unification in the treatment of exceptions. Definition of the "material invention" should be provided. This is because, apart from chemical substances, there are inventions of medicines, foods/drinks and daily commodities, and so on.

Furthermore, the issue of the examination guidelines discussed in this paper derives from the fact that they fail in analyzing the process of formation of an invention by experiments as discussed in the paragraph (2.3) (2).

7.3. General Reference for the Way of Describing the Scope of Patent Claim and the Specification

For example, the *Markush*-type formula, a way of writing a claim, describes the scope of a patent claim in a single-choice formula as follows: "A ○○ which is selected from a group comprising A, B, C and D." In the above, the elements A, B, C and D have similar properties.

In many occasions, explanation is made that this is used in the chemical field. However, it should be understood as being applicable to the material invention. To the contrary, it is unlikely in the physical-object invention that several articles with similar properties are gathered into the same group.

Not limited to this example, the consideration of the categorization of the physical-object/material invention is useful for description of the specification and the scope of the claim.

8. Utility of Consideration of the Physical-Object/Material Invention (2)—Patenting an Invention and Enforcing a Patented Invention

8.1. Recognition of an Inventor/Joint Inventor

The categorization of the physical-object/material invention contributes to the recognition of an inventor/joint inventor through considering whether experiments were necessary for the formation of an invention.

(1) Remarks on the recognition of an inventor/joint inventor

Involvement in an invention occurs during the process of forming an invention. Therefore, recognition of an inventor/joint inventor inevitably requires a consideration of the process of forming an invention. Generally, a joint inventor indispensably contributes to the establishment of a model or conception based on a principle. Since the conception on principles and the establishment of a model are characteristic elements (main parts) of an invention, the notion of the

physical-object/material invention is useful for determining the characteristic elements.

(2) Recognition of an inventor/joint inventor and contribution ratio of the joint inventor

In the physical-object invention, recognition of its inventor is easy. As in the material invention, however, it is difficult to understand a principle of the invention, many inventions are formed through experiments, and a tentative principle is not in an extent enough to predict experimental conditions/products having an effect (see, the foregoing (2.3) (2) ②). In this case, the inventor is recognized as a person who (i) has discovered a reproducible phenomenon, (ii) has set up experimental conditions or (iii) has obtained a product having an effect.

Even in the material invention, there is an occasion that a tentative principle is enough to predict experimental conditions/products having an effect (see, the foregoing (2.3) (2) ①). In this case, the inventor is recognized as a person who (i) has presented a tentative principle, and (ii) has set up experimental conditions or (iii) has obtained a product having an effect.

The contribution ratio of the joint inventor is determined considering the extent of (a) contributing to the establishment of a model or conception based on a principle and of (b) contributing to the above (i) (ii) and (iii) in the case of an invention made by experiments.

8.2. Review of the Theory of Dividing an Invention into Constituent Elements, and Inventive Step and Construction of the Technical Scope

(1) A Theory of Dividing an Invention into Elements

In order to understand the divided constituent elements to compare a plurality of technologies, the following two points have to be kept in mind. For such comparison, the categorization of the physical-object/material invention is indispensable beyond its usefulness. It is typically applicable when comparison is made on chemical properties and their transformation in the material invention in particular.

① Be aware of the interaction among each element

In a physical-object invention, there are no interactions to cause a transformation of substances between each element. Each element is considered to have been merely placed in parallel.

In a material invention, however, it is considered that one element is influenced (operated) by other elements and the nature of the material of the element is transformed. It is considered that there is an interaction between each element.

Therefore, in a material invention, in particular, it is not enough to formally compare elements to understand whether a technology is different from or similar to another technology. It is necessary to substantially look into the existence and/or extent of a new function (principle and its utilization to show such function) to be caused by a different element or element to be added.

② Be aware of the difference in the significance of elements

Constituent elements are different in their importance. This significance can be caused by factors such as (a) whether an element itself is known or new; (b) whether a principle and its utilization in an element is main or not, in the entire function of an invention; and (c) the extent of characteristics to the function/effect by a principle and its utilization in an element.

Because the theory to divide an invention into elements is, so to speak, a formal and literal analytical approach, the following approaches are suggested. First, in the case where we observe the constituent elements of an invention or technology, we grasp its entirety, that is, whether it is a physical-object or material, or which part is for the former and which part for the latter. Next, although the following can be applied in a physical-object invention, especially with regard to material invention or the material part of it, we should consider a principle and its utilization between or behind elements. Thus, we can make a substantial and deepened analysis of an invention. The principle/utilization expressed in the element is less understandable in the material invention than the physical-object invention.

(2) Inventive step and construction of the technical scope

The theory of dividing invention into elements is applied in order to compare an invention applied for a patent with prior art to find the inventive step, and compare the technical scope (the scope of rights) with a suspected infringing technology to determine infringement. For such application, it should be looked into whether the invention at issue is the physical-object invention or material invention. If it is the material invention, an appropriate determination can be made by looking into the principle and its utilization existing between and behind the elements as discussed in the preceding (1).

8.3. Relation to Use Other Person's Patented Invention (Dependency of Patents. "Related to Patent Invention by Others")

It is stipulated that an owner of patent (A) cannot implement the relevant patented invention if the invention utilizes a patented invention owned by someone else (B) ("related to patent invention by others") (Japanese Patent Law Article 72). For (A) to be able to implement the relevant patented invention, (A) needs to have a license for the patent of (B). If (A) does not have the agreement with (B), the implementation of the patented invention of (A) falls in the infringement against the patent right of (B). This relation to use another person's patented invention is understood on the basis that the prior patented invention should basically be "used as is".

A situation like this is easy to understand in terms of a physical-object invention, while it is difficult to understand in terms of a material invention. For instance, in a material invention where (D) is added to (A), (B) and (C) as raw material/components, the addition of (D) will change the reactions of (A), (B) and (C). This is due to the change of properties caused by adding (D). This can

be hardly considered as "used as is".

8.4. PBP Claim

PBP claims should be applied only to (parts of) the material invention. Its properties, especially those in chemical reactions, show the reasons and the way of using PBP claims.

(1) Necessity of PBP claims and criteria for admitting PBP claims

① Necessity or inevitability of PBP claims

As stated in (2.3) (2) earlier, an invention is recognized to be formed even if the principle is not understood, if we can obtain a reproducible and useful product by experiments or otherwise.

With regard to a material invention, in particular, there are many cases where the principle is difficult to understand and the results of the experiments are not sufficient to predict based on the tentative principle, from the process through which an invention was formed. In these cases the experimental conditions, reproducible phenomenon, and a product having an effect appear simultaneously as an integrated unit ((2.3) (2) ②). Among those results, the experimental conditions and reproducible phenomenon may also specifically indicate the manufacturing method of the product. Accordingly, in some cases it is difficult to identify a product by its structure or characteristics[20] and it becomes inevitable to depend on the manufacturing method for its identification.

This is the explanation of necessity or inevitability to admit PBP claims. That is based on the scientific and technological reasons.

② Criteria for admitting PBP claims

(a) Inventions admitted in PBP claims and limits on admission of PBP claims

(i) A process for manufacturing (manufacturing process) is a continuation of sequent process steps. This situation can be expressed in the following wherein [a], [b] and [c] are process steps.

manufacturing process: [a] (Raw) materials → [b] manufacturing steps → [c] product (having an effect)

In the process steps for the physical-object invention, an object of each process step remains as a part of products having an effect (or a component) in many occasions. In this case, the object becomes a part of the constituent of the product having an effect.

In the process steps for the material invention, however, transformation in the properties of an object of each process step may occasionally be influenced by other process steps. Then, the properties of the object are transformed through the ordered process steps and finally, it becomes a product having an effect. The product produced in each process step may change in quality and does not con-

[20]TevaJojiserujāruzātokeruenmukedorēsubenyutārushashāgu v. Kyowa Hakko Kirin Co., Ltd. (2015) HanreiJiho 113; 1417 Hanrei Times 75 (Japanese Supreme Court, Jun. 5, 2015).

The above judgement provided that as the guideline of the approval of PBP claim, the identification of the product by means of the structure and property is "impossible or utterly impractical". The Japanese guideline was changed in accordance with this judgement (2016).

stitute (remain in) a product having an effect in many cases.

(ii) The physical-object process steps can be stated as more independent, as compared with the material steps

As a result, in the physical-object invention comprising the physical-object process steps, the "parallel placement" of each process step can show a structure of a product as it is. But in the material invention, the parallel placement of process steps cannot show a structure of a product.

Therefore, there is no need to use the PBP claim in the physical-object invention to identify a product. It is conceivable that the need of the PBP claim is in the material invention.

(iii) Process steps admitted in PBP claims

PBP claims should be considered basically when the process step is a material type. Especially the process steps in which the characteristics of the properties, the transformation of the properties, or the interaction with other process step are substantial, should be focused. These are normally the characteristic process steps. In other words, PBP claims can be admitted for those process steps.

(iv) Limits on admission of PBP claims

PBP claims may be admitted only when it is impossible or extremely difficult to identify the product through its structure or characteristics. Accordingly, in reverse, those cases would constitute the reasonable limit for admitting PBP claims.

Therefore, the PBP claims should be limited to cases where "the principle is difficult to understand, and the results of experiments are not sufficient to predict based on the tentative principle" ((8.4) (1) ①) as an invention.

(b) Criteria for admitting PBP claims

(i) The object is only a material invention.

If the PBP claim is not admitted in the physical-object invention, the number of PBP claims shall be decreased significantly.

(ii) (Characteristic) material process steps in which the characteristics of the properties or the transformation of the properties, or the interaction with other process step is substantial, are focused.

(iii) The use of PBP claim should be limited to the cases stated in the above (a)

(iv) ("Limits on admission of PBP claims" as an invention.

(iv) The product is patentable (sufficiency of patent requirements);

Before going into patent requirements, discussion is made on the paragraphs (i) through (iii).

(2) Identification of the product by its structure or characteristics and product identity in PBP claims

In order to make a PBP claim useful in actuality, a patent right with the PBP claim has to be enforceable for injunction of infringement and claims for damages. For that purpose, a criterion has to be established to identify a patented invention and the structure/characteristics of a suspected infringing product, and

to prove identity of the matters.

① Identification of a product

(a) Identification of a product by its structure or characteristics

A product should be considered identified by its structure or characteristics "if a tentative principle is extracted and the experimental results are possible to predict based on the tentative principle" in PBP claims.

(b) Reasons

The case of "a tentative principle … are possible to predict" given above can be deemed as the opposite side (that is, the state where PBP claims should not be admitted) to the criteria for admitting PBP claims ((8.4) (1) ② (b) (iii) for reference). Therefore, that this case is regarded as the content of the "identification", should be on the ground that the problem of insufficiency of structure in PBP claim is resolved, and it should be considered reasonable.

② Identity of product in the PBP claim

(a) Criteria for admitting identity

Comparing two identified products, these products should be regarded identical in "the case where the tentative principles are mostly common, and the products having an effect which are possible to be predicted from those tentative principles are of almost identical structure or characteristics".

(b) Reasons

Reasons are as follows.

It would be reasonable to assume that the structure of products having an effect, which leads to the tentative principle, mostly common, would be almost identical. Furthermore, the identity of the structure of products having an effect is regarded sufficient as long as such identity can be almost confirmed; however, the identity of the composition should be necessary because the technique of measurement of composition is developed.

8.5. Use Invention

"A use invention is an invention in which an unknown property in a known material is discovered to have a new applicability by virtue of the discovered property." (The decision of the Tokyo High Court, decided April 25, 2001[21]).

The Examination Guideline says, "The concept of the use invention is generally applied to the technical fields in which it is relatively difficult to understand how to use the product from the structure or name of the product, (for example, the technical field in which compositions containing chemical substances are used)." On the other hand, it is said that the concept of a use invention is not applied to machines, instruments, articles, and apparatuses, and so on, because these products are usually used in fixed manners.

In other words, the use invention is applicable to the material invention and not applicable to the physical invention. If it is said so, the use invention is more

[21]Nisshin-Seifun & Tokkyo-chōChōkan (2001) Chiteki Zaisan Saibanreishū, Japanese Supreme Court website, (last checked 20 July 2017) http://www.courts.go.jp/app/hanrei_jp/search7.

understandable.

In Figure 10, technologies in the material type are referred to as being versatile. The use invention is thought to be exactly compliant with the technical development of the physical-object/material technology.

9. Way of Formation of the Invention by the Physical-Object/Material Invention

The categorization of the physical/material invention is essentially useful for analysis and evaluation of a completed invention. As a result, utilities are observed as seen in the foregoing Sections 6 and 7. Then, the principle and the way of its utilization can be considered so that their evaluation is graded up as the object of evaluation, relating to the way of forming an invention (see, Figure 2, left-side remarks). As we discussed in the foregoing (4.3), the content of its definition of categorization of the physical-object/material invention is common with the inventive principle of TRIZ concerning the way of making an invention as stated in Footnote 11 even its arrangement. Therefore, in the following, discussion is made on whether the categorization of the physical-object/material invention is applicable to the way of forming an invention.

9.1. Whether the Means for Solution Is Conceivable in Connection with the Physical-Object/Material Invention?

(1) Process of forming an invention

Process of forming an invention may likely be as follows.

① Set an assignment or theme to solve.

② Find relevant prior art with reference to above.

Review whether the prior art is in the physical-object type or the material type.

Analyze which parts belong to the physical-object type and which parts belong to the material type.

Extract the principle and the way of its utilization from prior art in the physical-object/material type and consider whether they are useable as a means for solution.

③ Consider means for solution.

And then consider such a matter as a new way of the utilization of a principle in the physical-object type, a new principle or way of its utilization in the material type, introduction of the material type into the physical-object type or vice versa, and the way of wide versatile use of the material type.

A detailed discussion follows in the next paragraph (2).

(2) Way of thinking on solution means relating to the physical-object/material type

The following argues this issue with a wide and flexible perspective. For example, as shown in Figure 1, with regard to the method (ii) (in the material invention) and the method (iii) (in the physical-object invention), review is made

on their functions, conditions of setting and costs and so on. In terms of the cost, the method (iii) seems to be less expensive.

① If it is a physical-object invention, consider the issue in the line of its extension.

In particular, review shall be made with a focus on the new way of its utilization of the principle.

② If it is a physical-object invention, consider the possibility of introducing a component in the material type as its constituent. That may lead to a formation of an invention that has mixed properties of both the physical-object type and the material type.

③ If it is a material invention, consider the utilization of a new principle and the way of its utilization.

④ If it is a material invention, consider the way of utilizing the material for other applications than those conventionally acknowledged. Reversely, consider the development of a property that will overcome the shortcomings of the conventional property. That would lead to a formation of a new material invention utilizing the material or a new physical-object invention.

⑤ Contrary to the paragraph ② above, consider the introduction of an article of the physical-object type into the material type. For example, as stated above in Figure 1, it may be conceivable to first consider the advantage and disadvantage of the methods (ii) and (iii), and then, use the method (iii) in an appropriate position.

9.2. Production of the Way of Utilization of a Principle for an Invention from the Physical-Object/Material Technology.

(1) Extraction of a principle/utilization from the physical-object/material technology (seeds)

① An essence of an invention is the way of utilizing a principle. This is an explanation generally acceptable, so we consider specifically applying this to the physical-object/material type;

② Put a technology (seeds) into the physical-object/material type in order and consider the technology as a basis for forming an invention, extracting the principle/utilization from it. Seeing an issue from the standpoint of the physical-object/material type will be helpful for use of the seed as a measure;

At least, it will give insight as to the approach of consideration to persons who have not had enough experience in forming an invention;

③ Furthermore, it can be said that the inventive step is large in the case where there is a gap between a tentative principle conceived prior to invention and the true principle found after the completion of an invention as shown in (2.3) above; and

④ When it is difficult to find out an achievement through experiments, resultant inventive step would be large. That is the case where each process of A, B and so on is hard to carry out and repetition of many processes is required as

stated in (2.3) above.

(2) Example of the way of utilization of a principle

A person who uses the seeds has to keep it in mind. In the following, discussion is made on the example of using *Bernoulli*'s principle for the physical-object technology in which a principle is easy to understand.

① Use of the upper and lower faces of a principle

It has to be kept in mind not only that a principle is actively used but also that it is passively used to extinguish the effect.

An example of the active use is the application of *Bernoulli*'s principle to the airplane to increase lift on the wings, as shown in **Figure 11**.

An example of the passive extinction is the application of the *Bernoulli*'s principle to the automobile not to cause a negative pressure on the back (streamlined) which hinders the vehicle from moving forward, as shown in **Figure 12(a)** & **Figure 12(b)**.

② Be aware of the difference between the principle and human perception.

Natural phenomenon which is hard for the five sensory organs to perceive but whose technical and societal utilities are large is paid attention to and used. A conception of such kind is one of the essences to create an invention.

One example is an air-cycled house where a ventilation of natural air flows in-

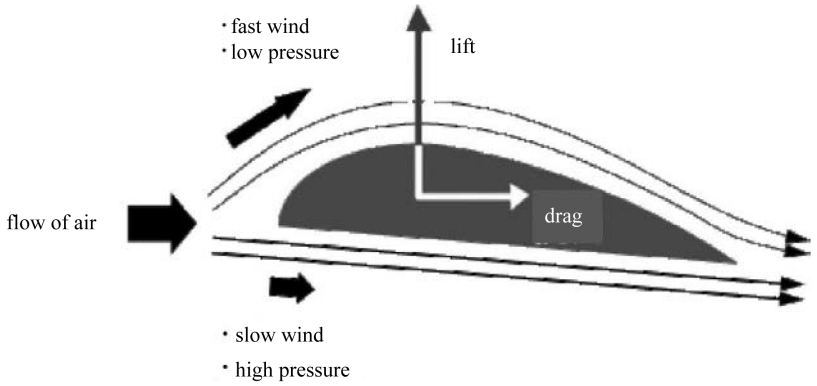
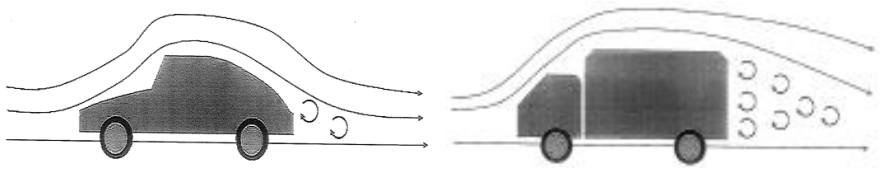


Figure 11. Shape of the wing of airplane[22].



(a) (b)

Figure 12. (a) Back of the vehicle (shape with a smaller negative pressure); (b) Back of the vehicle (shape with a larger negative pressure).[23]

[22]Woodford (2017). How do airplanes fly?, Airplanes.URL (last checked 20 July 2017). http://www.explainthatstuff.com/howplaneswork.html.

[23]The images are available at: URL (last checked 20 July 2017) http://blogs.c.yimg.jp/res/blog-e6-1b/miyabiman_now/folder/683048/06/25520806/img_1?1398410009

side. With the use of the *Bernoulli*'s principle, a negative pressure is caused by airflow passing beneath the roof of the house, which absorbs inside air and exhausts it to the outside of the house.

We feel positive pressure but do not feel negative pressure easily. However, negative pressure becomes powerful near the fast velocity in a large scale.

③ Effective application of the principle

Attention is paid to a technology that is functioning as a nodal point (an essential point for passing).

A good example is a sensor and its use (a sensor for cancer inspection in place of cancer-treating medicines. Its use is indispensable and compared with the cost for development and manufacture, resultant social and economic benefits are enormous.)

10. Summary and Postscript

10.1. Summary of This Paper

In this paper, discussion was made, with regard to the categorization of the physical-object/material invention, on such issues as: 1) looks of an invention, 2) definition, 3) relationship with the industrial/technical fields, 4) features in view of the formation process of an invention, 5) easiness/difficulty of identification of an invention (finding of the gist) and determination of the scope of rights based on the features recognized, and easiness/difficulty of patenting under such approach, and 6) relationship with the development of technology. Furthermore, in view of this categorization approach, the author elaborated on 7) the important issues of the patent law as cited on p.1 as the items 1) through 4), with additional explanations to his earlier points of view. As a new matter, the author discussed 8) a relationship with the examination guidelines regarding identification of invention.

The above can be illustrated in **Figure 13** for simplicity.

In the above, with the physical-object/material invention as a center, the right side of the figure relates to the looks and definition of the physical-object/material invention. The left side of the figure relates to easiness/difficulty of identification of an invention (finding of the gist) and determining a scope of rights based on the feature from the formation process of the physical-object/material invention, and reasonableness/necessity of considering it in the phase of patenting an invention. (Relationship between the above easiness/difficulty and the categorization of physical-object/material type is shown in the dotted line but not the solid line as it means a case of majority.) The lower part of the figure shows relationship between the physical-object/material type and the development of technology/the social economic life.

10.2. Postscript

In this paper, the author raised the categorization of the physical-object/material invention, as one of the views to look into the essence of an invention. With re-

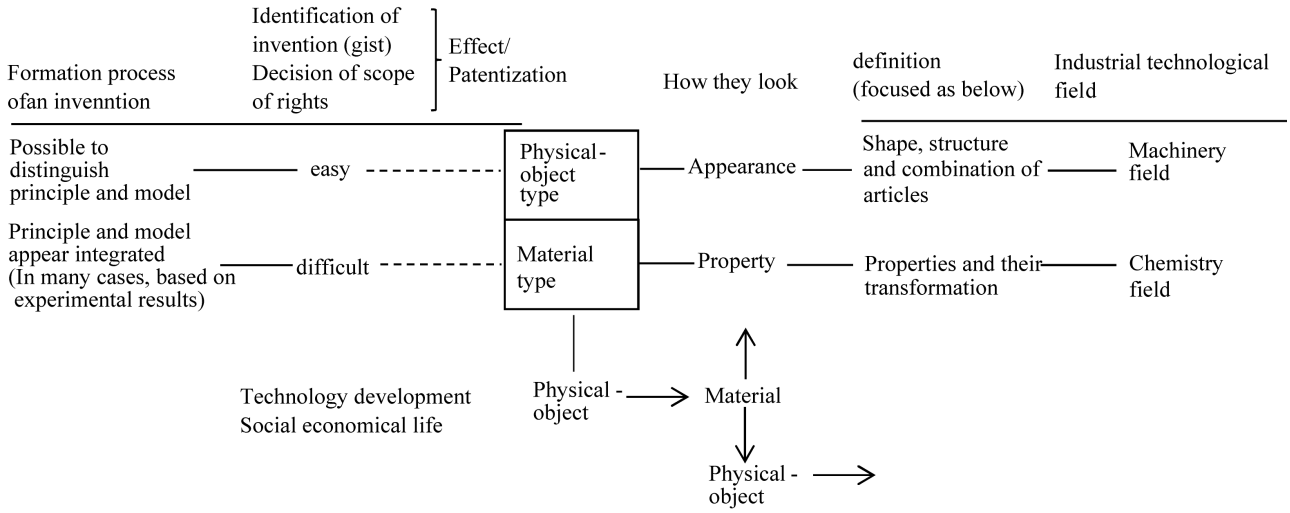


Figure 13. Summary of the categorization of the physical-object/material invention.

gard to it, the author discussed its ground, characteristics and reasonableness of considering at the time of patenting, and so on. The author has found that the categorization of the physical-object/material invention has a legal meaning which leads to legal effects and can be legally applied. With regard to some issues relating to the patent law, the author discussed the usefulness of the notion of the physical-object/material invention.

Furthermore, as a matter of process of forming a physical-object/material invention, the author has acknowledged that first a product of new utility is created and then a material of new excellent quality is developed for technical use. In combination of the two (or in a mix), they contribute, according to the author's observation, to the wealth of our social economic life.

The physical-object/material invention (the Opinion 1) can be recognized from the aspect of how they look (their appearance and properties). Being specific, the physical-object/material invention is understandable compared with the abstract "principle (and the way of its utilization)" which can be found in the formation process of invention (the Opinion 2) (see also (2.5)). As for the distinction of the material invention from the physical-object invention, a nominal classification based on the field of industry and technology (mechanical/chemical) can be used as a reference. Consideration of the property of a specific object parts and its transformation is enough to the extent that it can be observed from the outer appearance without extending to the issue of principle.

Therefore, it can be learned that the notion of the physical-object/material invention has a large amount of usefulness compared with the burden to use it. In the past, a similar concept to this was the categorization of "mechanical/chemical" to the utmost. However, the categorization of the physical-object/material invention can cover all of technology and invention. Deriving from their essence, it seems to be useful for solution of issues relating to the invention and the patent law.

From now on, usefulness in other fields than those discussed in this paper can be studied. In particular, it may help resolve issues relating to the identification of an invention and determination of technical scope.

Needless to say, issues relating to the invention and the patent law can be more adequately solved by applying together the Opinion 2 which is another major component of the framework of my view.

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