

# On Patentability of Inventions Facilitated by TRIZ Methodology

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## Abstract

This article aims to enclose the relationship between the inventiveness based on a systematic innovation approach (such as TRIZ) and the patentability based on patent examination procedure (such as MPEP), and will propose a feasible way to improve both inventions and their intellectual proprietary protection. A detailed examination of concepts generated by aid of TRIZ methodologies, their corresponding prior arts and prosecution history is performed. Some conclusions are drawn about the causes of rejection of inventions, and some suggestions are proposed as guideline for effective invention and patent application.

## 1. Introduction

Invention may fail in many aspects no matter what methodology the inventors adopt. The inventions may lose its value from many points of view from the birth of the invention, its development, its evaluation and verification, and also its transformation into intellectual propriety. The failures arise in the invention process are losing its focus in trivial details, solving the wrong problem, lacking of market, over-estimated value and sometimes know-how without protection. If the invention is applied for legal protection, failures may also happen during the prosecution process which challenges the novelty or non-obviousness (inventiveness) of the invention. As we know, a good invention without legal protection may lose its value, even the market significantly.

### 1.1 The discrepancy between invention and patent application

It's evident that there's a discrepancy between invention and patent application. An invention is evaluated as good because of its industrial utility, which requires focused targets, competitive positioning, good understanding of the use scenarios, and satisfaction of users' needs and well-defined scope of product development. Besides these basic functions, a good invention should understand the concerned problems and provide an invention solution concept. The defined problems and theirs solutions are then the basis for determining if the patent application is novel or non-obvious, and are examined by the examiners in Intellectual Propriety Offices (IPOs) according to the search report.

It's then evident that a good invention is strengthened by its planning, solutions and practices,

while a good patent is strengthened by its novelty and non-obviousness (inventiveness check) with respect to the searched prior arts. In another words, a smart invention may be objected because existing prior arts deny its patentability, but a less smart invention may be approved on the basis of lacking prior art.

From this observation, this study would focus on the relationship between the inventiveness and its patentability, and would like to find out some rules or suggestions that would help us to improve the possibility of getting a patent from the IPOs.

## 2. Prior art practice and TRIZ thinking

There are many different grounds on which a patent can be invalidated, among which, the most common one is that the invention is found to be not novel or obvious in the light of the prior art. So, to get a patent invalidated, the first step is to locate documents that can be considered "prior art" against the patent's claims.

Prior art basically means any disclosure of the contents of a claim, prior to the application for patent. Five types of prior arts are referenced by the IPO examiners including, prior invention, documents accessible to the public for a year, prior application, obviousness, double patenting.

It'll be interesting to see by examples how prior arts are used to against or approve an patent application.

### 2.1 Case 1: non-obvious (inventive)

An invention of a "bicycle with a reflector", which provides a solution by adding a reflector that allows other road participants to see the driver on his bike in the dark due to the light reflecting on it. When an IPO examiner receives this patent application, he'll try to analyze and establish the technical problem the application wanted to

solve, which is “enhancing the visibility of the driver during dark weather conditions”. A closest prior art of a “bicycle without a reflector” is then established and detailed searches in the patent databases are launched. If further prior arts are grouped, which disclose the common solutions provided by car, airplane and signal towers, which solved the problem by “adding a headlight to signal the presence of the object”. By comparing the application solution (a bicycle with a reflector) and the common solution (an object with a headlight) with regard to the closed prior art (a bicycle without a reflector), a skilled person (in this field) would add a headlight to the bicycle instead of adding (non-obviously, smartly, unexpectedly...) a reflector on it. The application is then judged non-obvious with respect to the found prior arts.

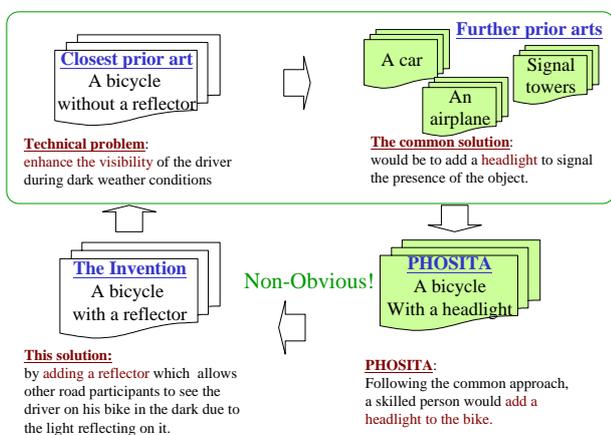


Figure 1 An invention that is non-obvious.

### 2.2 Case 2: obvious (non-inventive)

By the contrary, if the further prior arts are grouped, which disclose the common solutions provided by a traffic panel, a jogging show and a safety workwear, and solved the problem by “adding a reflective tape or panel to signal the presence of the object”. At this time, the application will be judged obvious because a skilled person would add a reflective tape/panel to the bicycle in view of the existing prior arts without difficulty.

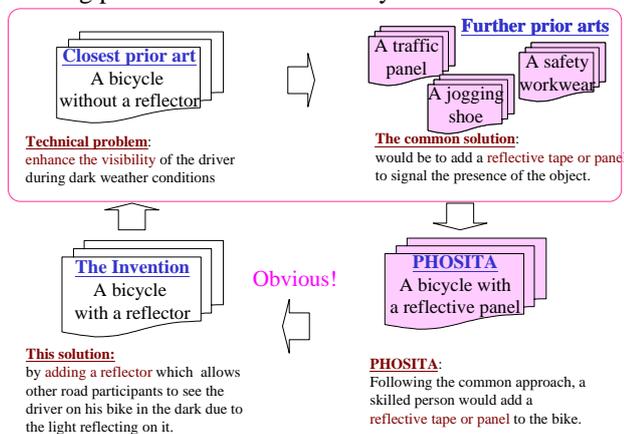


Figure 2 An invention that is obvious.

### 2.3 Case 3: similarity in TRIZ process

It's interesting to have a look at the same case but from TRIZ problem solving process which may reveal the similar logic of thinking. A TRIZ practitioner would reorganize and solve the above examples by transforming the specific problem (a bicycle without a reflector) into the generalized problem (increasing the visibility). We would then go the general solutions that include “adding a headlight or a reflective tape/panel on the object which could signal its presence”.

The similarity between the non-obviousness (inventiveness check) and the TRIZ problem solving process demonstrates an important question: it's evident that our example produces a solution concept that is not inventive (in sense of IP protection) even by aid of an inventive methodology (such as TRIZ). This may frustrate many TRIZ practitioners for a long time, and is challenged by the managers in the enterprise. Instead of criticizing the incapability of TRIZ in this issue; the author would like to ask, what we can do if the general solution we select was disclosed by the prior arts?

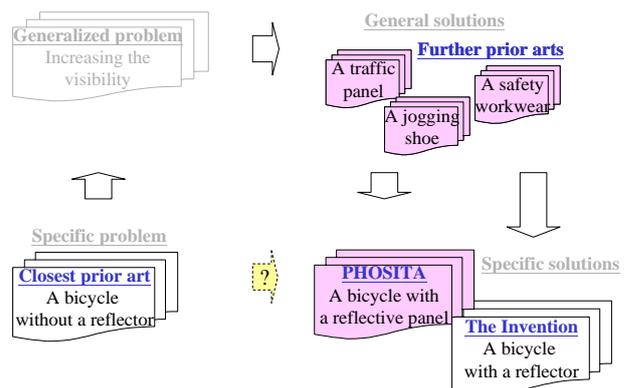


Figure 3 Similarity of TRIZ problem solving process and inventiveness check process.

### 2.4 Prior art issues in invention and prosecution process

As one of the most effective way to invent, TRIZ guides the users to get suggestions from other disciplines, and proposes concrete tools such as inventive principles and standards. Its emphasis on ideality, resource, contradiction, functionality and evolution is also instructive for problem solving process. The engineers would like to adopt TRIZ to solve inventive problems which contain contradictions and not solved yet other place. But, how to determine if a problem is solved somewhere else before?

To determine the inventiveness of a solution in the sense of prosecution, the prior arts play an important role in the process. Being approved for patent application, the prosecution process begins with claiming scope with drafting and application, objection and reply during the

office actions, and enforcement action if the patent is granted and infringed. The prior art plays the role of limiting and decision of the claim scope and their validity.

### 3. Case study:

In order to explain the real situations an invention would confront in the prosecution process, we chose a design topic in the textile industry for demonstration.

#### 3.1 Environment / microclimate and garment system

The effects of environment and microclimate on a clothing system are major concerns of the clothing/textile industry, especially in the field of outdoors. The influence of humidity, rain and sun on the clothing wearer makes the human body sweat and produce heat, which would form a microclimate full of vapor and wetness. These factors raise uncomfortable feeling of the wearer and may consume more energy during exercise. The common ways to solve these problems are adding some openings on the garment, or adopting moisture permeable / water proof fabrics.

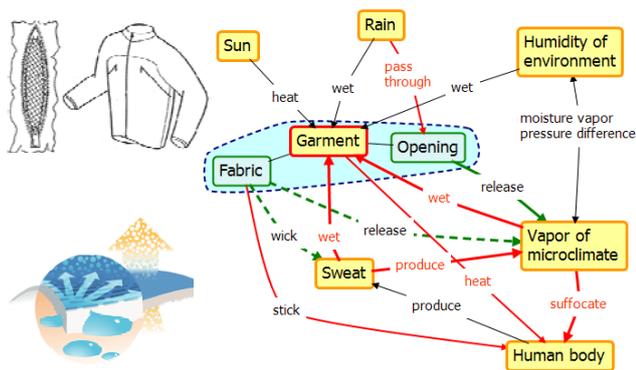


Figure 4 Effects of environment and microclimate on a clothing system.

#### 3.2 TRIZ problem formulation and its solutions

We could formulate the problem statement by TRIZ way:

##### By Technical Contradiction:

- The opening will release the moisture, but the rain will leak into the garment.
- The fabric could absorb the sweat, but the wetted inner surface will stick on the skin.
- The garment could protect the body from cold, but the enclosed system will suffocate the wearer.

##### By Physical contradiction:

- We need opening while it's hot, but no opening while it's raining.

- We require a fiber that absorbs water and not absorbs on the skin.
- We want a garment that contacts and not contact the human body.

Or, by Su-Field analysis:

- The fabric wicks inefficiently the sweat.
- The fabric releases inefficiently the vapor of microclimate.

Or, by Trimming:

- Could we design a garment without opening which could keep the human body from being wetted from outside, but still being kept dry and warm inside?

It's then the time with TRIZ problem solving tools which will produce innovative solutions like a membrane which is permeable to vapor but impermeable to rain, or a thin substrate with holes that contract while the weather is cold but expand while the weather is hot, or a fabric whose spaces between fibers are opened while the fabric is wet but are closed while the fabric is dry.

These solutions conform well with TRIZ philosophy, but what situations will they confront during the prosecution process?

#### 3.3 Investigation on the patentability of a similar concept: MMI's hydrogel patent

##### 3.3.1 The patent application

As a studying example, we've chosen a patent application EP01894482A2 which is drafted by a famous inventor, MOSHE ROCK, of MMI company. This invention discloses "A textile fabric (10) includes a smooth surface (12) with one or more regions having a bound coating of hydrogel (14) exhibiting expansion or contraction in response to change in relative humidity or exposure to liquid sweat or a combination thereof, adjusting insulation performance, air movement, and/or liquid management of the textile fabric (10) in response to ambient conditions."

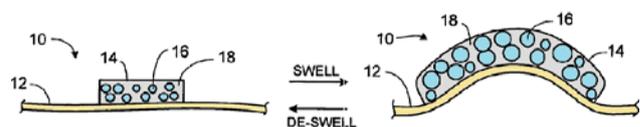


Figure 5 Temperature and moisture responsive smart textile.

It's no doubt a good example which solves perfectly the problem statement in a TRIZ way. The invention adapts a smart material (hydrogel) that interacts with the conditions of the environment and modifies the microclimate of a garment system by changing shape of textile fabric on it, the most importantly, by itself! It's

inventive enough, but what would the examiners of IPO say about it?

**3.3.2 Claims formulation**

We examine the claims at first, this patent claims a smart material which changes shape of textile fabric by depositing the hydrogel on the textile fabric by coating or by interlacing hydrogel yarns/fibers in the textile fabric. The characteristics of the invention are claimed independently in claims 1, 23, 31, 43.

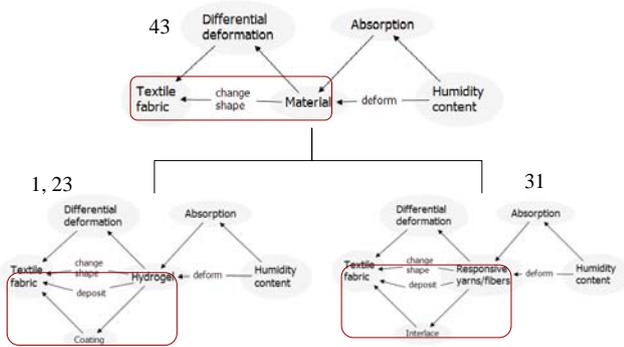


Figure 6. Overview of claims structure.

**3.3.3 Way-Function-Result approach and Su-Field analysis**

The claim scope could be reformulated in Su-Field models, which express the relative actions and effects on the corresponding elements. We also found a similarity between Way-Function-Result approach and Su-Field analysis, the former is an important way to examine the technical characteristics of a patent, and the latter is effective to view the functionality and its effect on a system. By this similarity and expression, an invention could be viewed as the combination of many effects: as figure 7 indicates, this invention combines the functions of deforming material, changing shape of fabric and adjusting form of garment, the obtained result goes to a garment that is responsive to environment and microclimate.

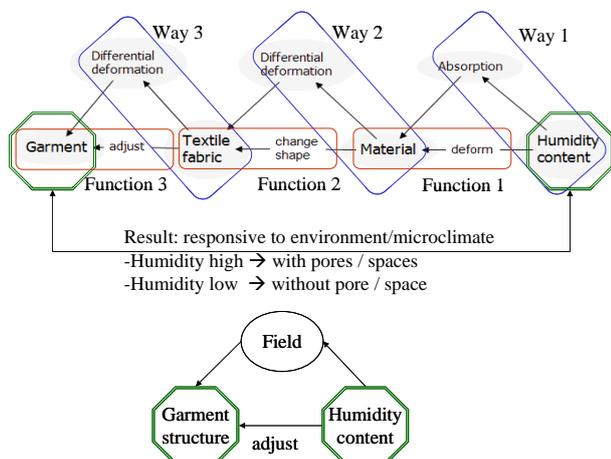


Figure 7. An invention is the combination of many effects.

**3.3.4 Opinions of patent examiners**

A search report provided by EPO reveals the viewpoint of the examiners on this invention. In this search report, numerous patent documents are provided to the examiners as prior arts. Some of them are taken as identical inventions (US2002132540A1, WO04011046A1), some are prior arts of inventiveness (US2003208831A1, US6241713B1, US6927316B1, GB2403146A). It's evident that the examiner doesn't take this invention as inventive enough, and the worse, has been invented and disclosed at least in two inventions. These prior arts, partially or completely, disclose the mechanism of liquid absorption, environmental responsiveness, or the techniques of deposition of hydrogel on the fabric.

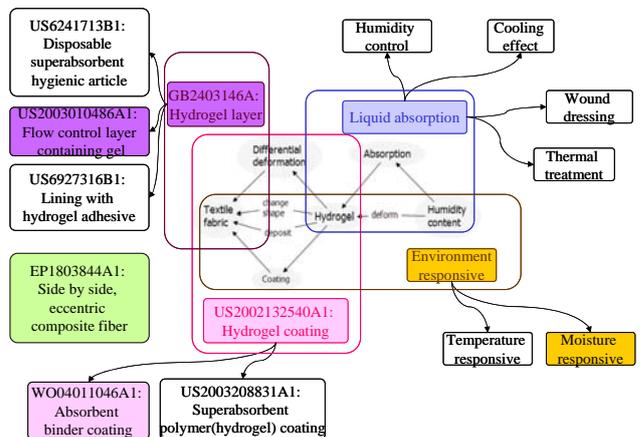


Figure 8. Prior arts relevance of patent application EP01894482A2

**3.3.5 Observations**

There are some observations on this patent application,

As indicated above, the claimed scope (claims 1, 23) of this invention will be limited by combination of the disclosed prior arts, which means:

- The idea of forming a hydrogel layer by coating on a textile substrate cannot be taken as patentable.
- The adoption of humidity responsive material on a textile article cannot be taken as patentable.

EP1803844A1 further discloses the characteristics of claims 31, which means:

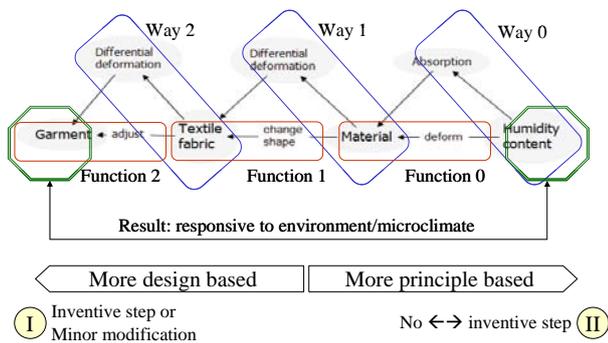
- Even with the idea of forming a hydrogel layer by knitting/weaving a hydrogel yarns, it's taken as obvious.

By examining the dependent claims, the patentable claims would be the deposition patterns of hydrogel on the textile, which will facilitate the adjustment of the garment.

**3.3.6 Summary**

In summary, the concepts claimed in this invention are all disclosed by the cited prior arts, which will probably influence its patentability. The cause of this conclusion may be due to simply adopting the existing principles / concepts, simply combing the existing elements / systems, or the limitations are from usual processes / materials (coating, binding, fabric forming, co-extrusion...) which cannot be taken as involving an inventive step.

This patent application could be possibly granted because of its further limitation of the design of hydrogel-deposited garment, which stands for a new way to adjust the garment structure in accordance to the environment / microclimate changes.



Combination of > 2 prior arts vs.  $\textcircled{I} + \textcircled{II} \rightarrow \textcircled{III}$  New way?

Figure 9 The principle and design based invention.

#### 4. Suggestions and conclusion

We can never predict if the prior arts exist until the invention appears, but by understanding the mechanism of prior art in the prosecution process, we could always limit the claim scope then, and get the maximal protection by the patent.

Using TRIZ for inventive solutions cannot assure a patentable application, it's better that avoiding the simple combination or adoption of existing principles, effects and elements in your invention. If necessary, non-trivial combination of more than two existing concepts will be allowable. If the adopted functions and effects are already disclosed in the prior arts, try to get principle based designs and make it in TRIZ ways.

Finally, it's also recommended by using TRIZ to decompose/analyze your invention, and execute the prior arts searches accordingly, of course, before your patent application.

#### 5. Reference:

1. "When is something prior art against a patent?" <http://www.iusmentis.com/patents/priorart/>
2. Daniel Ravicher, "FINDING PRIOR ART FOR AN

ISSUED PATENT", <http://www.pubpat.org>

3. "Differences between US and European", <http://www.iusmentis.com/patents/uspto-epodiff/>
4. MOSHE ROCK, "Temperature and moisture responsive smart textile", EP01894482A2

#### 6. Profiles of author

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Tzu-Chang CHEN is researcher of Taiwan Textile Research Institute, and is specialized in knowledge extraction and representation of scientific and technical information, also their applications of patent analysis and product development in textile domain.

He emphasizes currently on the improvement of functional textile design process, which integrates the TRIZ methodology and patent information.