

Outdoor Rescue Product Design Based on TRIZ

Li Jia-yang¹; Wang Yan-wei²; He Xiang-zi¹

(1. School of Mechanical Engineering, Harbin Institute of Petroleum, Haerbin, Heilongjiang, 150027, China 2. School of Mechanical Engineering, Purdue University, West Lafayette, IN, 47901, USA)

Abstract

With the rapid development of modern material life, the basic physiological needs are no longer the pursuit of people's pursuit, more people pursue a deeper level of security needs and spiritual needs. In recent years, people have paid more and more attention to safety and health issues. Among them, the most involved are health care and post-disaster relief. As people's ideology changes, outdoor activities are becoming more and more abundant. How to ensure people's safety when they are in danger outdoors becomes an important research topic. Based on the TRIZ theory, this paper uses the object field analysis method to quickly identify the core problem. Through the 40 invention principles of TRIZ theory, we study the rescue products that are the main disasters in the outdoor activities, and finally develop an outdoor encounter. Beast, drowning, companion lost, injured, lack of water and food, etc., through anesthesia needle injection, inflatable airbags, signal bombs, positioning, remote control, emergency kits, water collectors, firearms, etc. to improve their own and others' survival chances Multi-functional rescue products.

Keywords: outdoor rescue; Emergency; TRIZ; Anesthesia needle;

With the rapid development of modern life, the principles of product design are no longer limited to practicality, aesthetics, and economy. More often than not, people focus on safety. With the improvement of modern people's material standard of living, the security needs and social needs in Maslow's hierarchy of needs theory have gradually come into people's vision. In recent years, the development of TRIZ theory has made people from all walks of life start to think about how to carry out innovative design to serve human life. For different environments and different target groups, the focus of the designer's product design gradually shifts to safety and health.

1. Rise of TRIZ theory

1.1 Overview of TRIZ

The TRIZ theory was founded in 1946 by G. S. Altshuller, who is also known as the father of TRIZ ^[4] In 1946, Altshuller began work on a theory of problem solving.

The core idea of modern TRIZ theory is mainly reflected in three aspects.

First, whether it is a simple product or a complex technical system, the development of its core technology follows the objective laws of development and evolution, that is, the objective laws and patterns of evolution. Second: the constant resolution of technical problems, conflicts and contradictions is what drives this evolutionary process. Third: the ideal state of technical system development is to achieve as many functions as possible with as few resources as possible.

G. S. Altshuller Institute has proposed a variety of tools of TRIZ series for more than 50 years, such as 76 standard solutions, 39 engineering technical characteristics, matter-field analysis, ISQ, 40 invention principles, etc. These tools provide the basis for the software of innovation theory and thus provide conditions for the practical application of TRIZ.

Compared with traditional innovative methods, such as trial-and-error method and brainstorming method, TRIZ theory has distinct characteristics and advantages. Using TRIZ theory can greatly accelerate the process of people's creation and invention and can get high-quality innovative products. It can help us analyze the problem systematically and quickly find the essence or contradiction of the problem. It is not to avoid the contradiction, but to accurately determine the direction of problem exploration, break through the thinking barrier, break the thinking stereotype, and analyze the problem with new vision, aiming at solving the contradiction. It can predict the future development trend according to the law of technological evolution and help us develop competitive new products.

2. development history of outdoor rescue products

2.1 significance of outdoor rescue product design

With the improvement of people's living standard, more people pursue a deeper level of security needs and spiritual needs. In recent years, people pay more and more attention to safety and health problems, especially health care and post-disaster rescue.

With the change of people's ideology, there are more and more outdoor activities.

It has become an important research topic how to ensure people's personal safety when they encounter danger in the outdoor. The design of outdoor rescue products enables people to increase the safety factor when carrying out professional or non-professional outdoor activities, and can effectively improve the survival probability when encountering disasters outdoors.

2.2 design and analysis of existing outdoor rescue products

As the design industry covers a wider range and more types of product design, the design of relief products are classified in detail. The existing relief products in the market are mainly disaster relief and medical relief. Post-disaster relief products are mainly targeted at natural disasters such as tsunamis, fires, earthquakes and hurricanes. When human beings are in danger, they can save themselves or others through products.

For example, the rescue tripod produced in China can transport the wounded soldier vertically and rapidly upward through triangle fixation and pulley transmission instead of manpower, effectively improving the speed of rescue. Due to the limited size of rescue equipment, it is easy for the wounded to move away from the hole on the ground, which is hindered by the shape of tripod. Increases the risk of exacerbation and delay. See figure 2-1.



Figure 2-1 rescue tripod

The us-made Junkin water rescue boat stretcher can be separated from the folding boat stretcher and can be carried after being folded. Stainless steel metal frame as the support, yellow polymer polyethylene package forming, the interior of the flat with a soft non absorbing foam pad, four fixed belt, an adjustable foot fixed plate, and is equipped with a removable type hoisting system and the 5 in 1 type floating module system, lives were transshipment, can be used in many kinds of situations separately using ontology stretcher can be used for land transport, with the hoisting system can be used for air transport, with floating module system can be used as a water rescue transshipment. After assembly, the

size is 215x61x19cm, the dead weight is 14kg, the bearing weight is 454kg, which belongs to the multi-functional transport stretcher. However, due to the concave design, there is a risk of triggering the injury when the casualty is carried in or out. See figure 2-2.



Figure 2-2 U.S. Junkin waters rescue boat type stretcher

To sum up, in the design of rescue products, there are more or less some contradictions. When the function optimization is greater than the disadvantages, the economic cost can be put into the market within the controllable range.

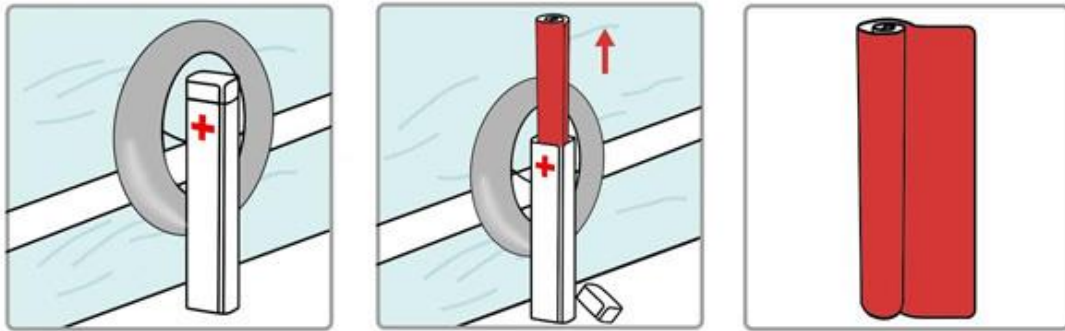
2.3 development trend of outdoor rescue product design

With the change of people's ideology, outdoor activities are becoming more and more abundant. In addition to the rescue work after natural disasters such as fires, earthquakes and floods, how to ensure people's personal safety in professional or non-professional outdoor activities has also become an important research topic. For example, the design of outdoor rescue products in recent years:

Figure 2-3 outdoor rescue blanket



How To Use



First Aid Blanket is installed by water side attached with life belts, so that it can be easily found in emergencies.

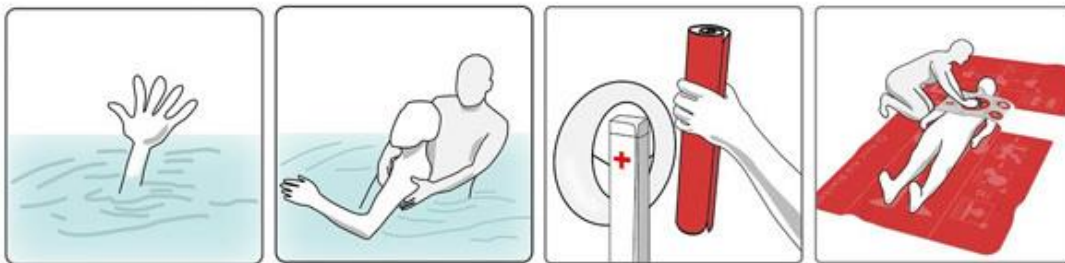


Figure 2-4 method of using outdoor rescue blanket

As shown in figure 2-3 and 2-4, this is an outdoor rescue blanket. By cutting and printing the blanket in proportion, the method of emergency treatment after drowning is marked on the blanket, which is convenient for people with less medical knowledge to save others and improves the survival rate of drowning personnel.

Figure 2-5 design of life jackets at sea

As shown in figure 2-5, this is the design of a lifejacket at sea. The original lifejacket is added with the design of SOS balloons that can rise, enabling air rescue workers to find people waiting for rescue more quickly.





“Air Rope”

Designed this rescue equipment to help the isolated and rescuers to rescue with ease and safe when stream is flooded by abrupt heavy rain

FIG. 2-6 air bridge design

As shown in figure 2-6, this is the design of a life jacket at sea. The original life jacket is added with the design of SOS balloons that can rise, enabling air rescue workers to find people waiting for rescue more quickly. The design of outdoor rescue products is based on the above two main lines to continue to develop, in order to improve their own or other people's survival rate for the ultimate goal to continue to innovate.

3. design of outdoor rescue products under TRIZ theory

3.1 the final ideal solution of outdoor rescue product design and the application of the invention principle

The ultimate ideal solution of outdoor rescue product design is to completely realize self-rescue and other-rescue, enabling people to realize the purpose of survival through the use of rescue products when they suffer from personal harm.

In order to realize the fundamental design as much as possible, the final design plan needs to consider the problems that may be encountered in the mountains, jungles, rivers, and seas in the outdoor environment. For example, how to avoid getting lost in the jungle, how to escape when attacked by wild animals, how to make others search and rescue quickly when in danger, how to meet basic survival needs in the wild, how to get out of danger quickly when drowning, how to deal with emergency medical supplies when injured, how to quickly understand their situation, etc.

Through 5, combination principle 6, multi-purpose sex principle, 10, action principle 11 in advance, on principle of pre-prevention 14, surface 32, color change principle of 35, physical or chemical parameters change principle of 40 invention principle, such as composite principle of TRIZ theory are combined, design the closest to the ideal solution of the final design scheme.

3.2 final design scheme of outdoor rescue products

Finally, an outdoor rescue product was designed. In order to be portable, the rescue product was designed in the shape of a bracelet, which does not affect the movement of people's hands, and can make quick response in an emergency. Through the application of the principle of the invention, in addition to the routine lighting and positioning functions required for survival, the injection anesthesia needle module is set on the hand ring, which is convenient for the rapid shooting and withdrawal of common small dangerous animals in the wild. The capsule medicine box is set for carrying small capacity emergency medicine. The built-in remote control module can operate the UAV to search and rescue others, collect information and deliver small goods in a short time. In the case of drowning, the inflatable module can be opened to realize the function of a water sleeve, and the rescue balloon can be set. In case of danger, the built-in inflatable balloon can be opened to the sky, and the

SOS balloon and LED light can be used to attract the attention of search and rescue personnel in the sky, to improve the outdoor survival probability of oneself and others. See figure 3-1.

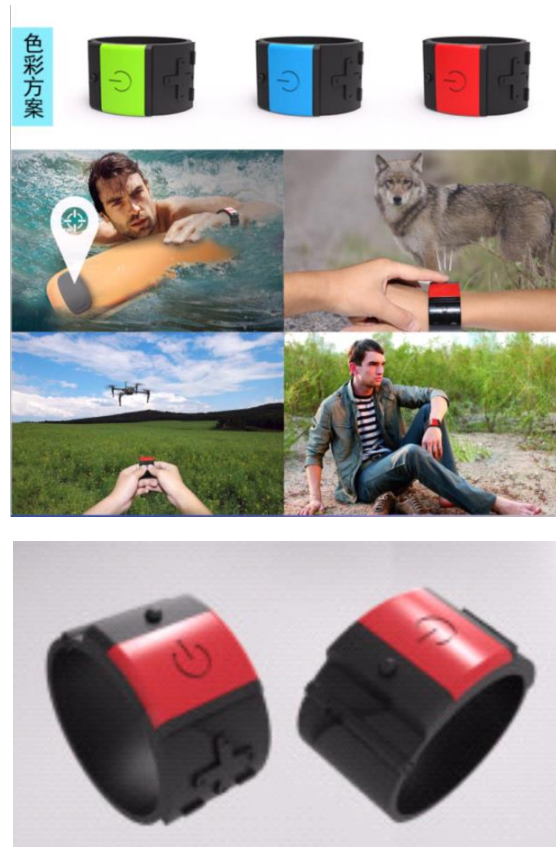


Figure 3-1 design of rescue bracelet

4. conclusion

Based on TRIZ theory, this paper analyzes the final ideal solution, and through the 40 invention principles of TRIZ theory, Study the relief products in the disaster-oriented environment that may be encountered in outdoor activities, and finally develop a multi-functional relief product to improve the survival probability of oneself and others. It provides further guarantee for human outdoor activities. Promote the development of rescue product design.

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Author: Li Jiayang

Co-author(s): Hanli, Hexiangzi, wangyanwei

Job: Lecture

Organization: Harbin Institute of Petroleum

Area of Expertise: TRIZ education, TRIZ competition



About the Author(s)

With the rapid development of modern material life, the basic physiological needs are no longer the pursuit of people's pursuit; more people pursue a deeper level of security needs and spiritual needs. In recent years, people have paid more and more attention to safety and health issues. Among them, the most involved are health care and post-disaster relief. As people's ideology changes, outdoor activities are becoming more and more abundant. How to ensure people's safety when they are in danger outdoors becomes an important research topic. Based on the TRIZ theory, this paper uses the object field analysis method to identify the core problem quickly. Through the 40 invention principles of TRIZ theory, we study the rescue products that are the main disasters in the outdoor activities and finally, develop an outdoor encounter. Beast, drowning, companion lost, injured, lack of water and food, etc., through anesthesia needle injection, inflatable airbags, signal bombs, positioning, remote control, emergency kits, water collectors, firearms, etc. to improve their own and others' survival chances Multi-functional rescue products.

Category:

6. **Art Systems** – poetry, musical compositions, theatrical performance, painting, literature