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QUALITY AND PROTECTION OF DIFFERENT LEVELS OF TECHNICAL IDEAS

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1 Introduction

Today, research and product development are necessary for the continuous improvement of products, and this process of continuous change requires new ideas. The mental processes that play a part in the solving of technical invention problems may lead to ideas for new products.

Experience in the generation of technical ideas with university students taking subjects such as Innovation and Patents [1] shows that there is no well-established system for the classification and recognition of technical ideas, but the construction of a diagram as ideas arise can be a useful aid to these mental processes. Though some processes of ideation of initial solutions show great potential for deriving new technical solutions, the patent system is currently unable to protect these ideas in themselves, but only protects the concrete solutions that emerge from them.

2 Tree showing levels of technical solutions

In the early stage of a conceptual design it is good practice to use an individual expression of one's first ideas without searching for external information [2]. It is also a good strategy to draw it in a diagram showing the dynamic process from the general statement of a problem to detailed solutions for it. Different ideations or alternative solutions can be reached after each previous technical decision. Possible solutions to part of the problem comprise one level of the diagram, which has the form of a tree.

The different levels of the tree indicate the quality of the ideas on how to solve the problem. The classification of these ideas correlates with the level of generalization and therefore with their potential for generating new ideas.

2.1 Example of the development of a solutions tree

An example may be used to illustrate the different levels of a technical idea, which begins with a first general idea: how to make a flat, luminous panel of a medium or large size, or, in other words, a flat lamp.

To make a flat lamp is an initial idea, or a proposition, which is the first level of an invention problem. This general idea is important because it has great potential for generating different solutions.

Subsequently, the standard mental processes of a person who has a certain amount of technical knowledge would lead him or her to apply technical solutions to solve this invention problem.

He or she may consider a variety of physical principles that might help to make a flat lamp, such as electroluminescence, fluorescence or a panel formed by many light-emitting diodes (LEDs). This is the second level of the mental process involved in solving this problem.

These levels of solutions can be laid out in a diagram in the shape of a tree. Figure 1 shows a partially developed solutions tree for the case of a flat lamp.

Let us suppose that the principle of fluorescence is the physical principle used to solve the problem. As is known, in a fluorescent lamp a discharge is maintained between electrodes in a rarefied neon gas with a little drop of mercury that emits an ultraviolet (UV) light. When this ultraviolet, electromagnetic radiation is absorbed by the phosphorescent coating of the glass tube, it is transformed into visible light.

The third level in Figure 1 shows the general, technical alternatives for a solution based on this physical principle. Two main paths can be taken to reach a technical solution: one involves deforming the cylindrical, fluorescent tube to attain a planar form, such as a parallelepiped, and the other having a separate UV radiation source that illuminates the fluorescent coating of a flat glass. The UV light is then converted into visible light by this fluorescent coating and this results in a flat lamp.

Let us suppose that the UV light that illuminates the flat glass coated with fluorescent material is chosen to implement the flat lamp. New, subsidiary solutions open up and the fourth level follows: now, the question might be, for example, whether to use a cylindrical UV tube or a single UV bulb to illuminate the flat glass coated with fluorescent material. A technical question also arises: what about the uniformity of the intensity of the light cast on the flat, glass surface?

To follow the exploratory tree through levels of “inventive” solutions in search of the final aim, that is, the flat lamp, let us suppose that we have decided to use a fluorescent tube because the illumination of the flat glass coated with fluorescent material is more likely to be uniform than that produced by a bulb. However, should one or more UV tubes be used?

Let us suppose that a possible solution at the fifth level of the decision tree would be to have a set of UV tubes. Let us also suppose that these UV tubes have an external, reflecting, metallic layer so that the light they produce is sent more uniformly to the flat glass coated with fluorescent material.

When the tree is developed, each new level has the potential to give several solutions, but this potential is progressively reduced with respect to previous levels.

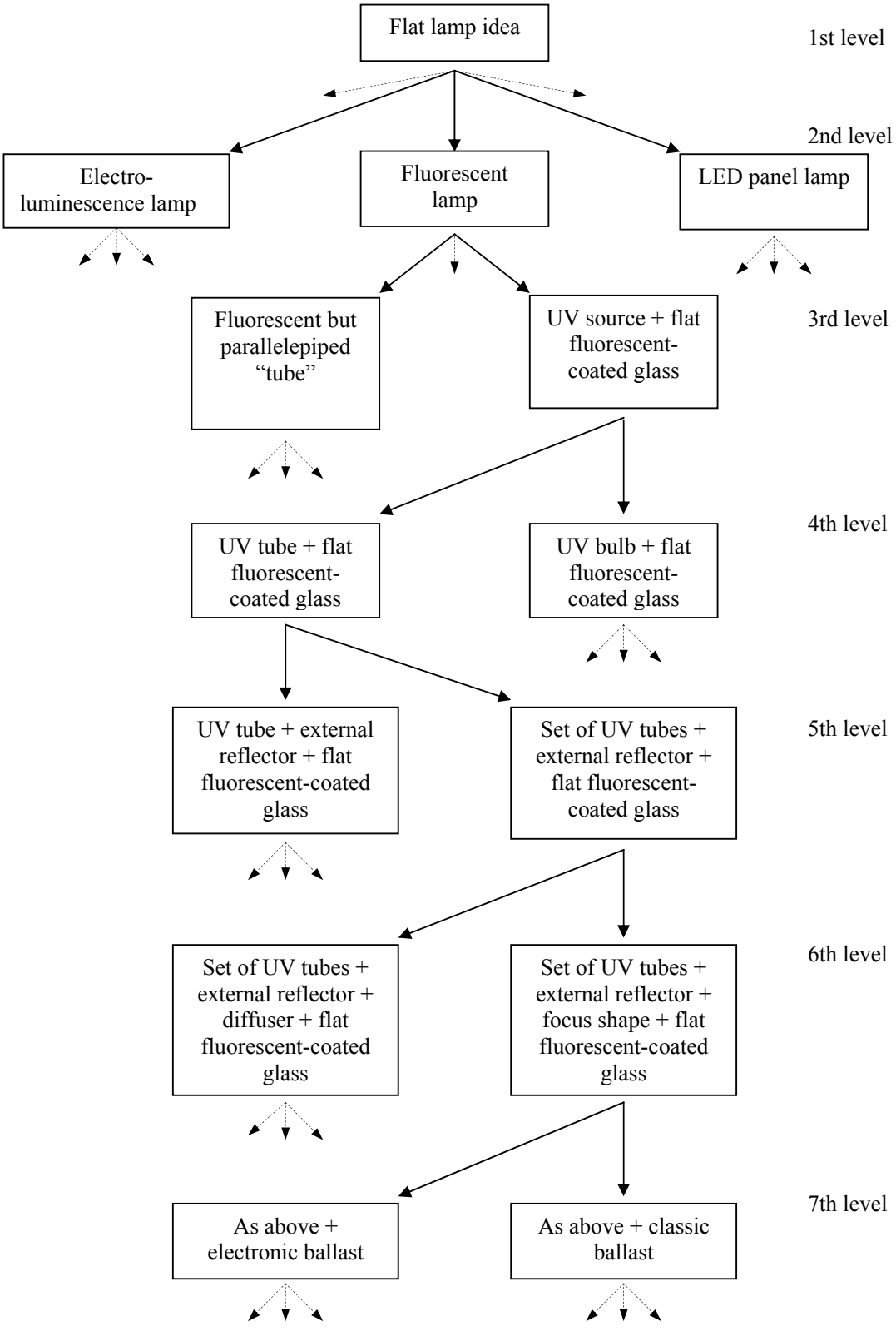

Figure 1. Partially developed decision tree for the example of the ideation process in response to the problem of inventing a flat lamp. Each level represents a certain degree of invention. Arrows that do not lead to a box generally indicate other possible solutions.

If the set of tubes with an external reflecting element is chosen and the process followed to reach the goal of a more uniform illumination continues, other solutions may appear at this (sixth) level. For example, it might be possible to place a diffuser of UV light between the set of UV tubes so that the flat glass is illuminated more uniformly, or to make rear reflectors for the tubes whose shape allows the UV light to be focused, thus producing a similar effect.

If the set of UV tubes with rear reflectors is chosen, other decisions must be taken for the final design to be implemented, such as whether to use fluorescent ballasts, fluorescent starters, and so on.

There is also the issue of the quality of the light that is to be emitted by the flat lamp. The decision of whether to use classic, magnetic, fluorescent ballast or electronic ballast may be the seventh level. In this case, electronic ballast would probably provide light of a higher quality.

The decision-making process could continue (although this is not shown in Figure 1). Other, minor, alternative solutions might be possible, and the process of reaching the final solution, and therefore the tree, would be longer. Other, more complex products would have more levels than the example of the flat lamp, in which case several trees would be generated for the different parts of the product.

2.2 Levels of ideas

The most general level is the idea of making a flat lamp (first level), and the next level involves general, scientific principles and their technical application to making this lamp (second level). Next, decisions must be taken in relation to the geometry and uniformity of the light in the flat lamp (third to sixth level). Subsequently, the material that is to ensure the desired quality of light must be chosen (seventh level). Safety, energy saving, useful life, maintenance and other aspects might also be considered in the process leading up to the embodiment of the idea or to a detailed design.

3 Patent protection

There are national agencies for the patent system in every country and there are also international standards and organisations such as the European Patent Office [3] and the World Intellectual Property Organisation [4]. Today, there are also patent databases on the Internet, such as Espacenet [5].

The different levels of the tree can be correlated with possible patent protection.

A mental process such as that explained in the example is possible, even in a short period of time, for someone who has some sort of technical background. The process begins with a general goal, in this case, the design of a flat lamp.

Let us suppose for a moment that this invention problem is thought of for the first time ever and that the technical solutions are reached over a short period of time. Let us also suppose that some of these solutions are technically developed up to the detailed design stage. It is not possible to register the general idea, that is, the first level, as a patent, because patenting requires a concrete, technical embodiment of an idea. Patenting is only possible for detailed

ideas, that is, the last levels of the tree. The patent system does not protect all technical ideas: it is possible to protect an enormous number of patents at the detailed level, or last levels, but it is impossible to protect a general idea from which a whole range of technical solutions might be derived, even though perhaps the real merit of ideation is the expression of this general idea.

The total cost of patenting all the technical solutions stemming from a general idea is high, and there are additional considerations, such as the time spent and the bureaucracy involved. As a result, the inventor of a general idea cannot suitably protect it, but can protect the inventions stemming from it via an expensive and intricate process.

There are also two further problems with today's patent system: the time that elapses from the priority date to the awarding of the patent and the time between the idea and the patent application. Possible solutions to these could be a patent registry [6] and an early registration system for ideas or concepts such as that established in France [7].

4 Results

The tree of possible solutions is a good graphic way of organising the representation of ideas and decisions for the early stages of individual conceptual design before including more information. This tree of successive ideas and decisions resulting from a mental process allows one to follow the path chosen to the embodiment of a particular idea, and also allows one to systematically explore solutions that have previously been rejected. In this manner, the graphic tree could, for example, be the starting point for the next discussion in the design group.

This tree can also be drawn up directly in the group, for example in a team working in integrated product development. The influence of good team cross-functional information is important in order to obtain a high-quality final product [8].

A measure of the quality of an invention is its potential for deriving solutions. The first levels represent general ideas that have the potential for a wide range of different solutions; the last levels, however, are of limited potential in this sense.

The patent system allows an enormous number of very similar patents to be filed but prevents the registration of technical ideas from which a great number of solutions may potentially be derived. Perhaps the greatest benefit of a future extended patent system would be the awarding of patents for general ideas from which a wide range of technical solutions may be derived.

5 Conclusions

A few levels of problem-solving for technical ideas are shown in the decision tree (Figure 1). This tree is a graphical aid that is used to explore solutions and to determine levels of quality in ideas and the possibility of patenting them. Patenting would normally occur at the lower levels of this tree.

There are no pre-existing specifications stating how a design problem should be solved. Constructing a decision tree—i.e. reflecting on the problem—is a flexible process that allows one to explore and come up with new invention solutions more easily.

Engineering design could be improved if the quality of technical ideas were given greater recognition (at the initial levels), since it would be a way of recognising the inventors of these ideas, even if their technical knowledge is limited, and would represent a new and dynamic source of ideas for industrial applications.

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