

The design of front and back grille of KAD-927 B fan with Nigel Cross Approach at PT. X (*A Manufacturer of Household Appliances*)

Popy Yuliarty¹ and Hendra Ardiwijayanta²

¹²Industrial Engineering Program, Universitas Mercu Buana Jakarta

E-mail: popy.yuliarty@mercubuana.ac.id

Abstract. PT. X is a manufacturing industry that produces household appliances especially electronic appliances. The appliances are Magic Com, Fan, Iron, Blender, Dispenser, etc. The product of this research is KAD-927 B fan, with the diameter size of 9 inches. The research took several parts, namely Front & Back Grille iron material that will be redesigned with plastic material. The method used in this study is Nigel Cross design principles, with sequential process stages: clarification of purpose, function setting, requirements setting, characteristic determination (QFD), morphological chart, alternative evaluation (AHP), and communication / improvisation . This research is also assisted with the help of CAD Autodesk Inventor and Auto Cad. The result of the design of Front & Back Grille is based on the customer needs (Engineering Staff). Specifications obtained from this research are as follows: additional function with handle, hook mounting process, spider web shape, Front & Back Grille color is white with PP (Polypropylene) material, light in weight, and with safe design so that fingers cannot get into the webs.

1. Introduction

Good product development process starts from the need of customers because if it is not, then there will be a lot of time that ends up bad with customers [7]. Approximately 35-44% of products failed and did not get high appreciation from consumers [2]. Levels of consumers' needs always collide with the producers because consumers always require maximum needs of visual and performance and durability of products, however; manufacturers have limitations. This is where one of the functions of product development comes in, namely bridging to define what consumers want, with what the producers do. In this research, product development took a case study at PT. X, which is a pioneer of home and electronics industry in Indonesia as a manufacturer to meet the market needs of the middle economic class. The product that is developed is a 9 -inch fan. It is already on the market and is still produced at PT X with the production capacity of KAD Fan reaching 927 44,000 units per month (December, 2016) . On the other hand, the company plans an alternative product design to replace the old product by replacing some components. The components which are replaced are Front Grille Assy and Back Grille Assy. The change is due to the impreciseness of Spot Weld machine that produce both parts. The use of Spot Weld machine will be stopped and Front Grille Assy and Back Grille Assy will be replaced with Front & Back Grille KAD 927 PL. This change is also due to the company's policy to make the efficiency of the operator and also the material cost. While the Front & Back Grille Assy were previously made of iron, in the new plan, plastic will be used. Both components are very important on the outlook when consumers are going to buy a product. Therefore, manufacturers will



also design products that are innovative and better than the previous models, with elegant designs which make consumers become more attracted. To avoid failure in the Front & Back Grille KAD 927 PL, the researcher will do research in advance by taking into account the previous concepts with the design phases of Nigel Cross approach. The problem of this research is how to make the new product design better and more efficient than the previous one, by not reducing the consumers' needs. The purpose of this research is to make the design of Front & Back Grille KAD 927 PL better and more efficient than the previous models.

2. Product design phases with Nigel Cross

According to Nigel Cross [4], the design of products is divided into seven steps which are described as follows:

2.1. Purpose Clarification Phase

It aims to determine the purpose of measurement of customer satisfaction and design improvement of KAD-927 PL fan by using Objective Tree Methods. The result of this objective clarification phase is an objective tree diagram (figure 1).

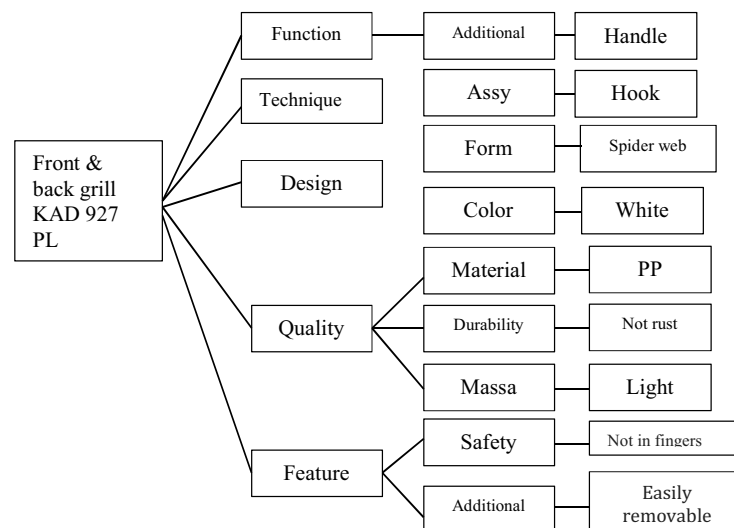


Figure 1. Diagram of Objective Tree Front & Back Grille KAD-927 PL

2.2. Function Determination Phase

The purpose of the function determination phase is to define the required functions by using the method of function analysis that can describe the input-output system of the process of making Front & Back Grille products with Black Box Principles and also Block Diagram which can be seen in figure 2 .

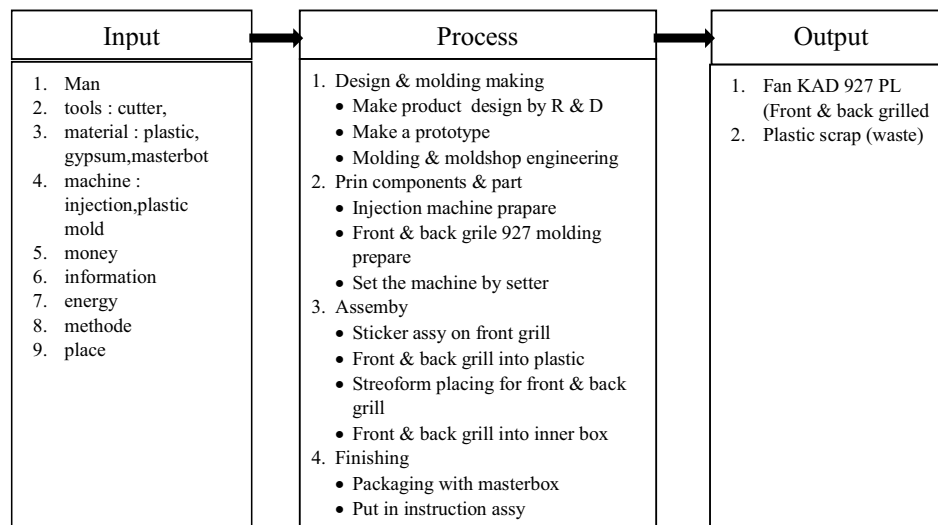


Figure 2. Input-Output System Front & Back grille KAD 927 PL with Black Box principles

2.3. Need Determination Phase

The next phase is to establish the need to create the exact manufacturing specifications necessary for the design. The method used is performance specification model. Here are the results of the steps in the need determination phase of Front & Back grille of KAD 927 PL:

- Create different levels of generalization from applicable design solutions. The alternative product is Front & Back grille of KAD 927 PL with an attractive motif design and good durability.
- Determine the level of generalization to operate Front & Back grille of KAD 927 PL which has an attractive design / motif, the product has a strong durability and anti-rust.
- Identify the performance of the required product attribute with 5W analysis.
- Completely set the performance requirement for each attribute Demand (D) which is derived from the consumer (Management) and Wishes (W) which is derived from the Designer tailored to the technical characteristics

2.4. Characteristic Determination Phase by QFD Method

The characteristic determination phase is used to find out the consumer's interest for Front & Back grille of KAD 927 PL. This can be done by using Quality Function Deployment (QFD) method, which translates consumer interest into product attributes that are tailored to the technical characteristics [3]

2.5. Alternative Generation Phase

This phase aims to collect as many alternatives as possible to solve problems in planning Front & Back Grille product of KAD 927 PL, then look for the best and potential solutions or alternatives.

2.6. Alternative Evaluation Phase

In this phase, the method used is Analytical Hierarchy Process [5]. The hierarchy is used to choose the best alternative of the three proposed alternatives which can be seen in Figure 3 below:

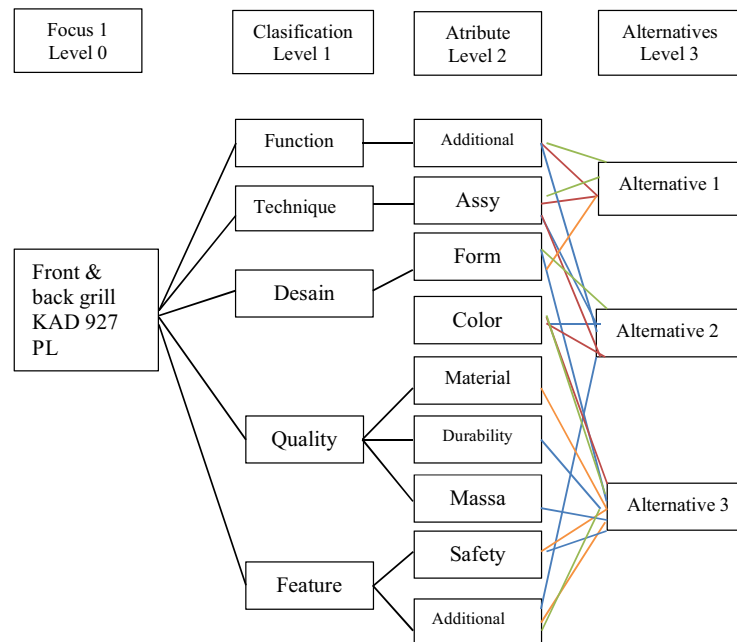


Figure 3. The Hierarchy in Choosing an Alternative Product

Based on the results of the overall priority vector calculation, the priority vector for each alternative is 0.530 for alternative 1, 0.255 for alternative 2 and 0.215 for alternative 3. Then the priority alternative is the alternative 1.

2.7. Repair Detail Phase

The final phase of the design process aims to increase the value of products for consumers and reduce costs that must be incurred by the manufacturer. Solutions that have been obtained from existing alternatives are then communicated to consumers through a product with all the attribute advantages possessed compared to similar competitors' products. This can be done by using Value Engineering Method.

2.8. Selected Design

Selected design drawing (alternative 1) used CAD Autodesk Inventor and Auto Cad [1] which can be seen in Figure 4 below:

- | | |
|-------------------------------------|------------------------------|
| 1. Addition | : Holder |
| 2. Part installment | : Hook |
| 3. Front & Back grille shape | : spider's web |
| 4. Front & Back grille color | : White |
| 5. Front & Back grille material | : PP |
| 6. Front & Back grille durability | : anti-rust |
| 7. Front & Back grille weight | : light |
| 8. Security | : fingers cannot get into it |
| 9. Additional feature (Maintenance) | : easy to remove |



Figure 4. Alternative Design 1

The component changes of the design before and after engineering can be seen in Figures 5 and 6.

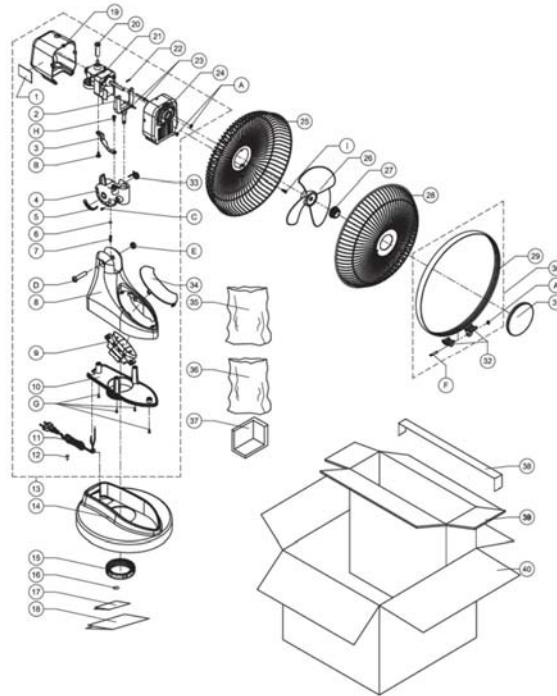


Figure 5. List of components before engineering

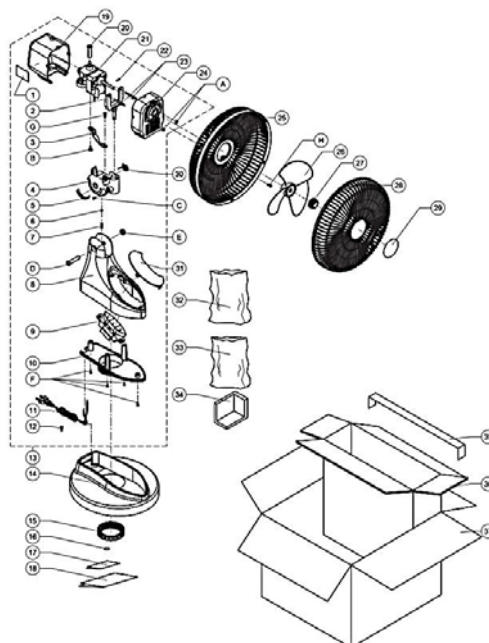


Figure 6. List of fan components KAD-927 PL (The Result of change)

From Figures 5 and 6, it can be concluded there are some components that are removed or replaced. The removed components are Belt Assy KAD-927 B and Front grille cover 927, due to the new design using the hook-locking system. While the original logo image which was on the front part grille cover 927, now it is directly on the front grille PL of the latest design.

References

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