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CONCERNING OF DEFECTS IN DESIGN AND MANUFACTURE OF THE PRODUCTS.CASE STUDY: REDESIGN OF THE CITRUS JUICER

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Abstract

Industrial products market is marked by a series of mistakes resulting from their design and manufacture. These defects are due to a superficial conceptual analysis, with emphasis on manufacturing to lower cost price, without a few aspects like: functional, ergonomic, aesthetic and cultural in product development.

This analysis is important because it combines all these aspects and which aim the final solution of the optimized product.

This paper proposes a method of study that identifies those aspects of the analysis of a product on the market that is a citrus juicer.

Redesigning the product is made using AutoCAD and Inventor Autodesk design environment. The method proposed in this paper it will be applied to any industrial product, respecting their particularities.

Key words: design, concept, 3D model, ergonomic, aesthetic.

1. Introduction

The development and definition of industrial products an important consideration is given to the design and structural analysis in all aspects for: functional, technical and economic, correlated with a few aspect for: ergonomics, aesthetics and culture area specific of the product, [1], [8] .

All these issues may be eligible for well-defined in structural analysis and objectively justified, which is a method that defines the final solution in constructive design of the product [13], [14].

Generation of ideas is reflected in the conclusions established in each stage of structural analysis, observing semantics industrial product such the final result lead to a higher degree of satisfaction of the consumer [3], [4], [6].

This paper presents an analysis of the actual situation of original design concept applied to an existing product respectively a citrus juicer.

The structural analysis presents a few essential aspects:

- Product presentation;
- The identification of flaws in terms of functionality, ergonomic design and execution and construction of the product;
- Redefining the concept its based on this analysis;
- Objective justification of the solutions that is finally adopted of the product from technical and economic point of view.

2. General considerations

For the analysis method is proposed to develop an analysis of the product on the market: juicer (fruit) citrus manually operated.

Thus the design and execution of identifying nonconformities identified an objective analysis of generation and optimization of the product in order to redesign and manufacture of optimal technical and economic conditions, [2], [9], [12].

The analysis method highlights aspects of the nonconforming product in terms of ergonomic, aesthetic and functional. These defects identified are from misuse of the product design phase and the execution phase of the parts of the product components, [7].

This paper proposes a method of generating structural analysis solutions for any product on the market in order to improve and optimize the manufacture of the product and it use in working condition by consumers.

We have considered several issues about the use and handling juicer in good condition by persons of full age as well as those of children.

The method of structural analysis of ideas, proposes several primary aspects analyzed in order to settle in industrial constructive thought.

Figure 1 presents a gradual structure of the method of analysis on industrial products.

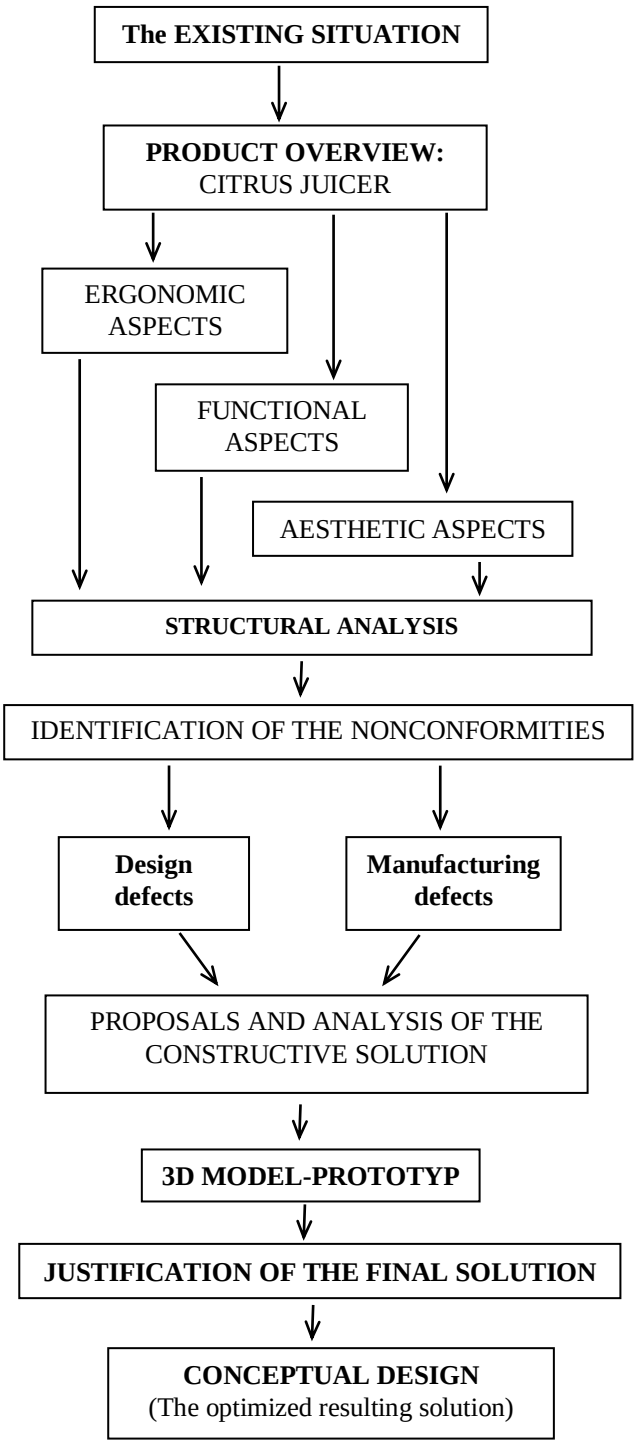


Fig. 1: Defining the analysis

The following aspects identify the working hypothesis:
- Required constructive settlement of a citrus juicer in order to provide comfort and safety in use;
- Product identification: juicer the cover and collecting vessel;
- Identify nonconformities in design;
- Identification of the non manufacturing;
- Optimized the solution proposals to remedy the nonconformities;
- Revealing dimensional's citrus juicer;
- 3D parametric modeling;
- Mold injection designing - each parts of the citrus juicer (it's not the subject of this paper).

Figure 2, presents the components of citrus juicer.

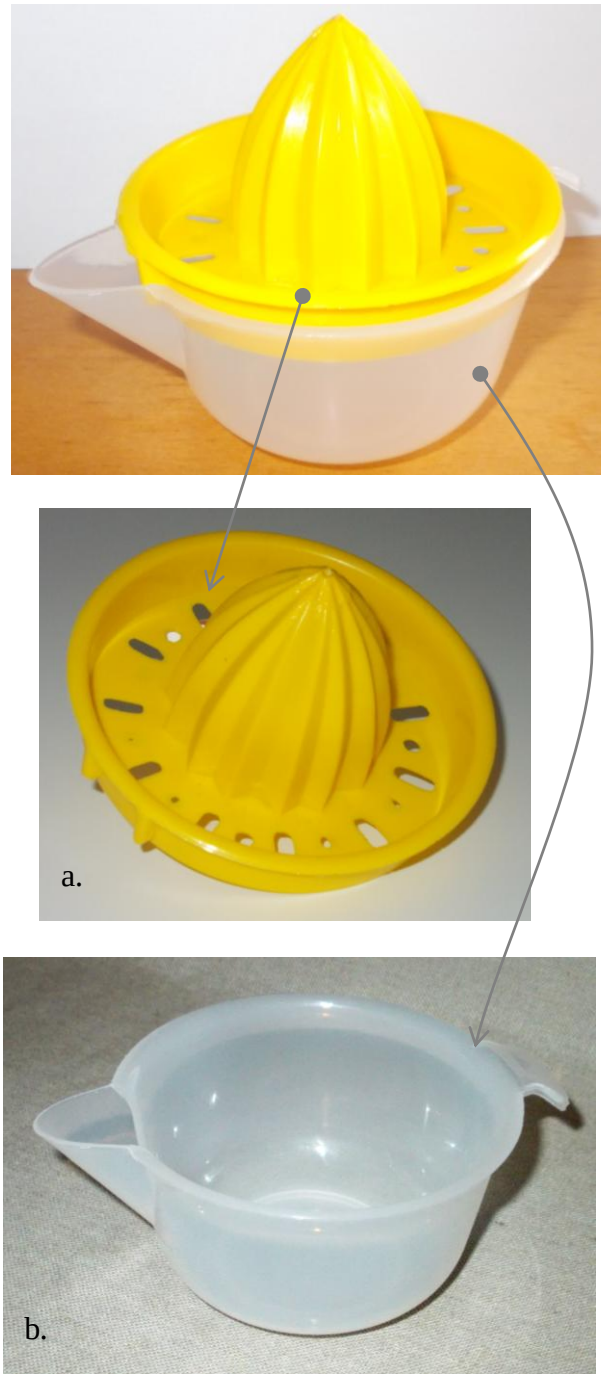
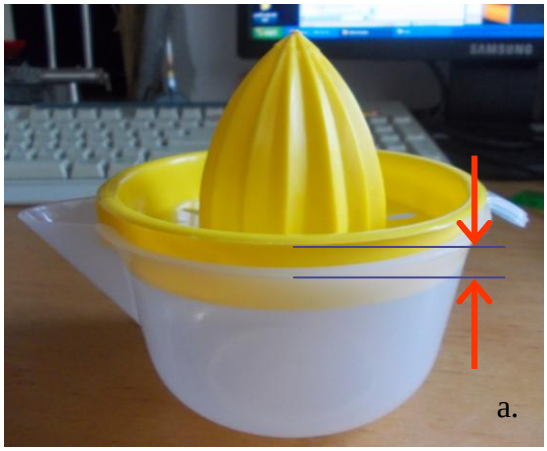


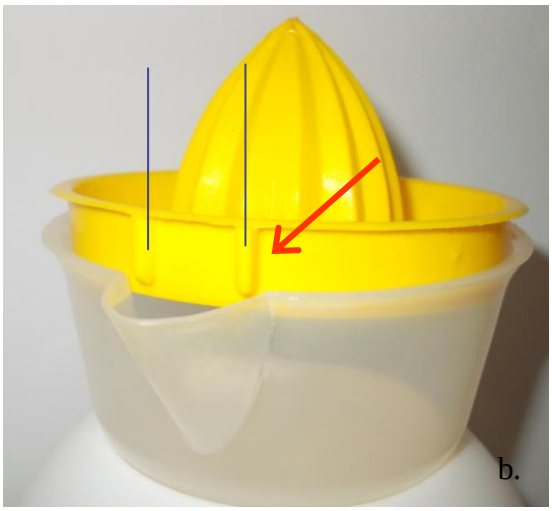
Fig. 2: Citrus juicer: a. Shaped cover juicer, b. Collecting vessel

3. The definition of the structural analysis

Structural analysis involves the following steps: **Step 1:** Identification of the nonconformities of the citrus juice, namely: design defects and

manufacturing constructive defects.
In terms of defects in design are found the following nonconformities:
- Different taper of the cover and collecting vessel, fig.3.a.;
- Rotation lock support: Since there deforms wrong design solution vessel while producing extra tension during use juicer. These tensions may develop cracks in material and consequently makes use of the vessel to make a poor, fig.3.b;
- The vessel top collector has a burr resulting from injection molding of plastic material, therefore: causing accidents, fig.3.c.
In terms of defects resulting from manufacturing parts, it highlights:
- In the critical section of the stand squeezing the cover has the same thickness, there are sometimes punched holes, resulting tearing the cover support during application couple of moments of forces in order to spin the fruit, fig.4.a;
- Incorrect positioning of cores produce filling defects inconsistent with their utility fig.4.b.





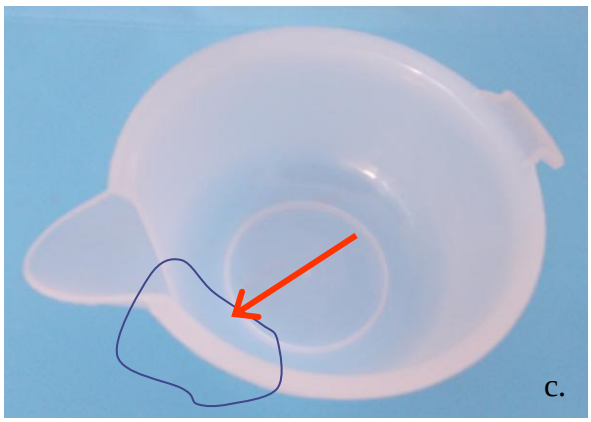


Fig. 3: Design defects

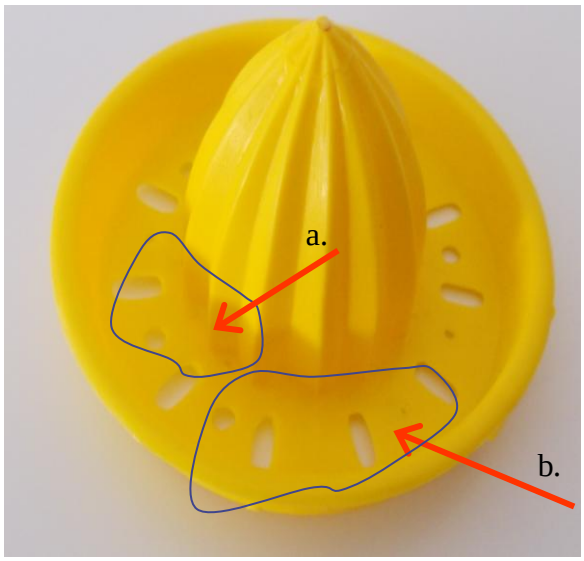


Fig. 4: Manufacturing structural defects

The defects of execution (manufacturing) is primary due to the injection mold defective execution.
In order to remedy these non-compliances included the following solutions optimized on the product:
- Identification the conical angle of collection vessel lid and be identical;
- Support orientation of the lock-rotation of the hopper the cover the angle is made after casting so increases the surface rotation lock the lid in position during use of squeezing fruit juicer;
- The edge of collection vessel is connected with a minimum radius to avoid accidents during handling collection vessel;
- In the plan section of the media spin and lid, proposes to increase the section by connecting with a minimum radius;
- The bars for holes in the lid will rectify lower die mounted able to share your access, thus closing the mold to identify a single plane of separation.
Step 2: Emphasizes the reveal dimensional marks, identifying dimensions is made by processing imported orthographic images in AutoCAD, their scaling and geometry redesign flask, [4], [5]. For the

cover's juice extractor its can direct measurements are taken on the part size, and tapering curves correlate the flask.
Figure 5, presents highlights several aspects of geometric and dimensional revealing how the dish of the collection.

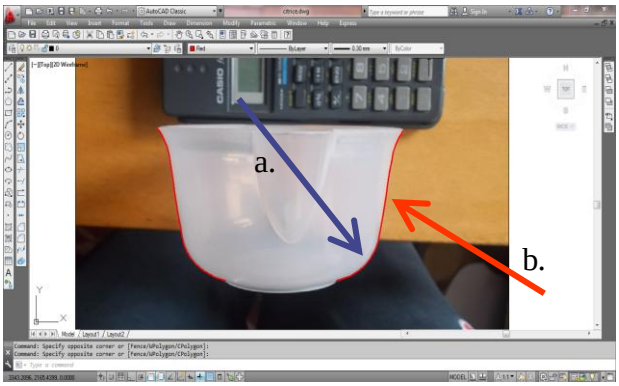


Fig. 5: Orthophoto import in AutoCAD environment; a. scalar curvature after orthogonal picture, b. the curve drawn in AutoCAD environment

Step 3: Define dimensional marks in the AutoCAD environment can be achieved considering the redesigned 3D model elements required in the analysis made in previous steps, [10], [11].
Figure 6 presents some aspects of the Inventor Autodesk environment the final version of the juicer.

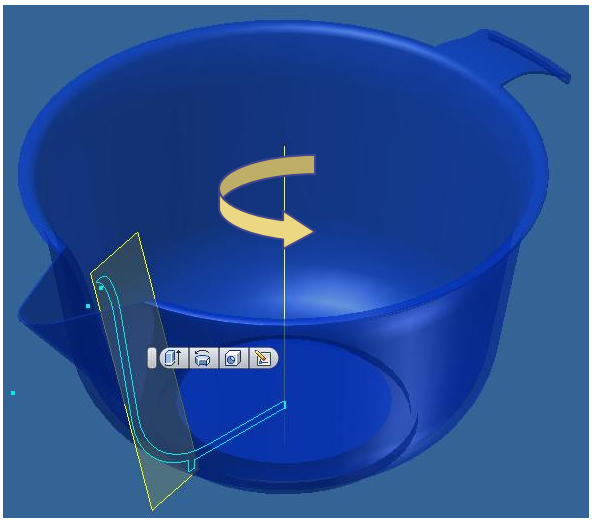


Fig. 6: The generator profile of collection vessel imported from AutoCAD to Inventor Autodesk environment

The generating collection vessel was made in Inventor environment, the module "Part" and cover modeling was done in "Assembly" so they could importing the geometry from 3D model of the collection vessel juicer.

Figure 7 presents some aspects of modeling the cover's citrus juicer.

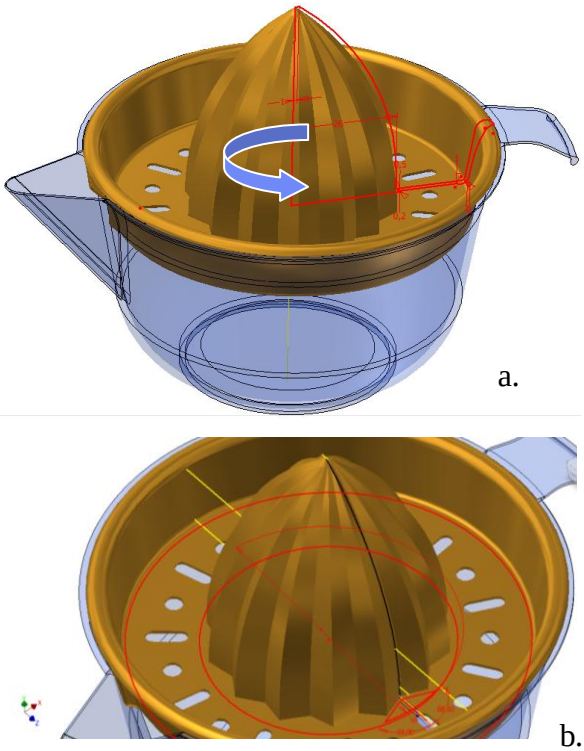


Fig. 7: Cover's citrus juicer: a. Generator profile, generating curve b. Directories curve and profile support on the cover of citrus juicer

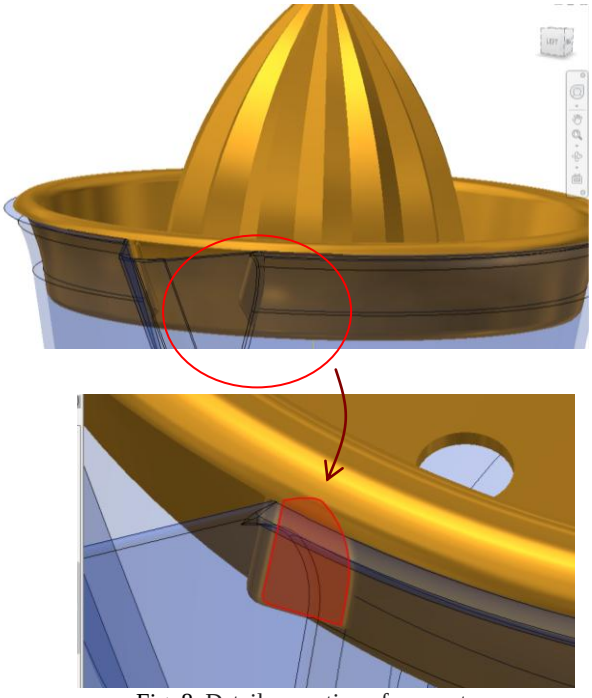


Fig. 8: Detail execution of support rotation lock the cover

In Figure 8, we can see some aspects about details of the execution of the rotation lock the cover holder that defines a contact surface. The geometry is imported from casting hopper the receiver of the citrus juicer.

In Figure 9, we can see 3D model of citrus juicer, Inventor Autodesk model.

Fig. 9: 3D Model of citrus juicer – the final concept

3. Conclusions

The study made several important conclusions can be drawn:

- Its method of structural analysis proposed in the paper highlights some inedited aspects that can be applied to any industrial product that is desired for an improvement in technical and economic terms;
- Redesigned model based on a special importance is given using AutoCAD environment which enables easy scaling and geometry defining the product;
- Autodesk Inventor 3D model, allows plastic injection mold for parts of the product;
- Redesigned the model its proposes the optimal solution for manufacturing of the product and 3D model we can imported in different environments use virtual testing method using, like FEM;
- Proposed study engineering allows thinking rigorously established based on analyzes to optimize and define the design concept applied to any industrial product;
- The proposed structural analysis can develop an original method for generating and managing ideas in order to improve industrial prouducts;
- Development strategy of manufacture, use the methods of design engineers, but for a structural analysis we well founded in terms of technical and economical, functional, ergonomic and aesthetic allows the manufacture of industrial products aimed at motivating customers from the design phase of products.

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