

SUMMARY

Overview of thesis process and analysis

In this engineering work, we were set to achieve a thorough methodological approach to the development process of a product or solution. The problem is an old design of a common piece of furniture that everyone uses, a cabinet. The solution is to integrate modern methods and engineering science into that simple old design and come up with a modern, practical, and applicable solution. That can be generalized and applied by both organizations and individuals.

In the first chapter we have done some research about the state-of-the-art of similar solutions. We analyzed their shortcomings and could formulate a set of primary functions that must be included in our solutions. We could determine what might give us a market chance. We moved on to the second chapter, where we started to gain more specific information about the contents of that cabinet and what are the fundamental parameters that we need to consider in our development process.

Next, we needed to formulate a clear picture about what the solution could be. We set the primary functions we have gathered and started to analyze them. Through an objective comparison we could find out the different function options. We could choose from and what advantages would they give us if chosen, and what disadvantages to avoid. Through combining these functions, we were able to generate different solutions and choose the one which had the highest number of advantages to be ours.

Now that the idea is clear, it is time to consider the fundamental parameters we sat. the initial conditions were chosen inside the frame of these parameters. Followed by a set of calculations that analyze the basic forces that would affect the system parameters. Finally, we could choose the right materials for our product along with the right parameters that we based on the calculations. According to the functions we have decided upon to give us the most advantages. We could model our idea into a virtual form that can be transferred to the real world.

Thesis results

From the first chapter, we could find that the negative trends in the nearly similar solutions:

- Overly priced.
- Inefficient use of space.
- complex design and use.
- Situation specific.

- Does not include safety option
- Does not include ice making options.

From the second chapter, we found that the smallest liquor bottle dimensions are 43 x 56 x 146 mm, and the largest is 158 x 90 x 340 mm. its average weight is around 1400 g. The smallest ice maker weighs 20 Kg when full, and has the dimensions of 310 x 230 x 325 mm. This information was used to formulate the fundamental parameters of the solution to be of 70 Kg load and of the dimensions 750 ± 40 x 90 ± 20 x 700 ± 60 mm.

From the third chapter, we can conclude that the most advantageous solution would have the following functions:

It will be a rectangular cabinet split horizontally into two halves. The frontal half is a storage space that is included in any cabinet with two main shelves and drawers that have doors covering them. The back half is the one hiding the liquor box and its lifting mechanism which is a twin electric lifting column attached to each side of the box. The box is split into compartments and made of wood and has a LED line illuminating it. The hidden box is covered by a sprung cover attached to the back of the cabinet. It is secured by a magnetic lock that is open by an electric switch hidden in the other half of the cabinet's surface.

From the calculations chapter we found that the final overall load will be 85-90 Kg over a trapezoidal screw driven by an electric motor that has 5.1 N.m torque, rotated for 1440 rpms, by an electric power of 769.1 W. To move the hidden box a 600 mm vertical displacement with speed of 0.12 m/s.

A full 3D model of the entire solution was created. It has accurate geometry and near accurate contents of what the real-world version would be.

Evaluation of thesis results and conclusions.

Working on this thesis has been quite educational. The result is excellent, we managed to create a full guide for any one professional or amateur to read and understand and then hopefully decide to apply our solution into a real-world experience. We reached the objective we set to achieve by the end we created a full innovative solution that would work in multiple situations for multiple people. An additional smart locking system that uses password or biometrics to operate could be added to the solution for future development. A solution where an electric-mechanical lifting mechanism could be used was not analyzed. More calculations discussing the wooden joints support reactions and shearing could have been done but we prioritized the essentials since the integrity of these joints are guaranteed from real life experience.