Design of Gumming Device for India Post

Project by:
Roshan L. Valder (8613007)
M.Des (Product Design)

Project Guide:
Prof. B. K. Chakravarthy
IDC, IIT Bombay
Introduction:

Tons of glue is wasted each year in the India Post premises. It also creates a mess around the office. Hence it was decided to design a non-messy and easy to use gluing station that can be used at post offices.
User Study:

Current Glue products at the Post Office usually consist of a container and an used-up pen or make-shift spoon with a viscous glue.

Problems

- Messy
- Hard to apply
- Causes wastage of the glue
- Aesthetically unappealing
Ideation:

**OPTION 1**

*Option 1* shows a vertical glue dispenser. The advantage is that the glue comes out on rolling or by rubbing the envelope on the glue bulb. In this concept there is a potential risk of leakage of glue. But it is very convenient for filling of glue and application of glue.
OPTION 2

Option 2

In this concept there is a glue dispenser button which dispenses a small volume of glue very close to the envelope. This controls the application effectively but could create a mess on the table in case there is no envelope or there is extra dispensing. As the product is used in public space, the chances of such misuse are very high.
Option 3

This is a horizontal glue dispenser where the glue tongue is narrow and long. It absorbs the glue and on application of the envelop, transfers the glue to it. When the glue dispenser is not in use, the wheel is turned up so that the tongue is no longer in the glue bar. The main disadvantage is the drying up of the tongue. The mechanism aided user interaction might be combersome.
Concept Selection:

Option 3 was selected as a final concept but for the convenience of the post office, a table mounted horizontal design was needed. Hence the concept was further developed and the drawback of the tongue was addressed.
Design of the Glue & Testing of the Concept

After testing different standard gum available in the market, none of them were found to work good. Hence a combined design was needed. Hence we approached Fevicol to redesign the gum with low viscosity and a surface tension that makes it easy for application on the envelop. To test the glue, we found an existing thumb wetter. The assembly worked very well. This led us to modify option 3 further and hence instead of using an absorbing tongue, we started using a ball which is more easy to clean when it gets dry.
Testing of Prototypes at IIT Powai Post Office:

Users slide the envelope over the ball using one hand and applied pressure onto the ball using the other hand.
A glue with high wetting and low film formation must be used to have the desired effect. A low film formation will ensure that the ball doesn’t get stuck to the aperture when it’s not in use and the high wetting will ensure good transfer of the glue from bottom to the top. The glue with the desired properties is being developed with Fevicol.
Auto lock by buoyancy

Application of glue through surface tension
Product Features:

- A separate container with water was used for gluing stamps thereby eliminating the use of glue for the stamps.
- The product can be mounted on the wall or bolted onto the desk so that it cannot be stolen.
- The product is made for abuse as it is made from stainless steel.
- Does not require a complex mechanism to work; works entirely on basic scientific principle of surface tension for transfer and buoyancy to prevent drying.
- A special glue with the right viscosity and drying properties was designed in collaboration with Fevicol.
Mock-up model:

Mock up models were made by milling moulds in PU foam and then vacuum forming the final form.
From the user study conducted on the design shown in the previous page, it was realised that for user convenience, the glue dispenser and the water dispenser should be two separate boxes. Hence this single dispenser was designed. The product was prototyped and tested as shown in next pages. The final product is to be made in stainless steel to provide the robustness needed for public space products.
Working Prototype:

The image shows a working prototype made through Rapid Prototyping and the custom-made glue. The glue had been tinted blue/red so that the user can easily see that enough glue has come on the envelop.
The lid of the prototype can be removed to pour in more glue each day.
The custom-made glue is poured in the box.
An envelop is slowly moved over the ball. The ball rolls and a thin layer of glue is developed on the envelop.
Image shows the glue transferred on the envelop.
Deep drawing is a sheet metal forming process in which a sheet metal blank is radially drawn into a forming die by the mechanical action of a punch. It is thus a shape transformation process with material retention. This method can be used to produce large number of these boxes at a relatively cheap price. The following pages show the fabrication drawings for the same.
Drawing: Top Part
Material: Stainless Steel
Process: Deep Drawing
Drawing: Assembly of Top & Bottom Part

Material: Stainless Steel

Process: Deep Drawing
Salient Features:

- Development of a special glue with Fevicol
- Design of a robust container in stainless steel which can be fixed to the table
- Buoyancy of the ball auto seals and prevents drying of the glue

Further directions:

The product must be prototyped in stainless steel or equivalent so that it is robust and can be used in public domain.

Prototype testing must be done with envelopes of varying thickness and type (E.g.: Mail envelopes, large envelopes)

Glue with desired properties needs to be further developed for mass production. The current glue developed is designed only for small volumes. Hence partnership has to be made with manufacturers of glue.