

Fabrication of Vending Machine

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Abstract - The utilization of natural manure shapes the spine and fundamental need of helpless farmers. The customary strategy for this project is about design and working of operation of coin operated vending machine. Vending machines mainly supply food are found in hotels, transportation terminal, and installation. An important component of vending machine is the mechanism that accepts and determines the value of inserted coin. When coins or tokens are inserted a series of test determines the dimensions, weight, electric properties, and magnetic properties of the money, a coin or token that fails any test is rejected. If the coin or token is accepted, its value is determined from the data acquired. It is based on electro-mechanical system.

Index Terms - Vending Machine, Transportation terminal, Electro-mechanical.

I. INTRODUCTION

This project is about design and working of operation of coin operated vending machine. Vending machines mainly supply food are found in hotels, transportation terminal, and installation. An important component of vending machine is the mechanism that accepts and determines the value of inserted coin. When coins or tokens are inserted a series of test determines the dimensions, weight, electric properties, and magnetic properties of the money, a coin or token that fails any test is rejected. If the coin or token is accepted, its value is determined from the data acquired. It is based on electro-mechanical system.

II. PROBLEM FORMULATION

This development of vending machine project was attached with the coin payment system. This project may have scope that will specify the pathway of this vending machine.

The developed vending machine is only a prototype and not readily functioning as commercial product.

The developed vending machine is for dispensing small and long-lasting products such as pens, pencils

etc. Item that does not last very long such as food is not considered.

The number of products can be dispensed is only in small unit not much than 15 items.

The method of payment of this vending machine is focusing on using coins.

III. OBJECTIVES

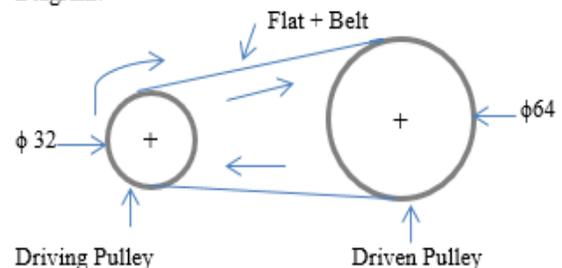
With regards to the popularity of vending machine in global market, the concept of project is evolved as per the business trend of our Indian Society. Vending machine is totally a new concept. It is not widely used here. So, for enhancement of technology in our society and for its further application, the project idea has been designed. It is user friendly and very simple in operation. Its simplicity within the complexity is its main features. Commercially over viewing, the main objective of our project is to launch new technology's application in the society. The project has vision that this may be the milestone product of technology in the Indian market.

Features of Vending Machine:

- 4 Types of products can be Vend.
- 5 Rs coin can be accepted.
- 10Rs coin can be accepted.
- One coin can be inserted at a time.
- Self-starting with initial coin.

IV. DESIGN CALCULATION

Diagram:-



D → Diameter of driven pulley → 64mm
 d = diameter of driven pulley → = 32mm
 Center distance between pulleys x → 1.2 M
 N = 600 rpm μ = 0.25(friction)

Tension T1 → 100N

We know that the belt length.

$$L = (r_1 + r_2) + 2x + (r_1 + r_2)$$

$$L = (0.064 + 0.032) + 2*1.2 + (0.064 + 0.032)$$

$$L = 2.701 + 0.00768$$

$$L = 2.708M \text{ (belt length)}$$

Angle of contact between the belt and each pulley

Let

θ = Angle of contact between belt and pulley.

$$\sin \alpha = r_1 + r_2/2$$

$$\sin \alpha = 0.064+0.032/1.2$$

$$\alpha = 1.48$$

$$\theta = 180^\circ + 2\alpha = 180+2*1.48$$

$$\theta = 182.9$$

$$\theta = 182.9 * \pi/180$$

$$\theta = 3.19 \text{ rad.}$$

Power Transmitted

T₁ → Tension in tight side of belt

T₂ → Tension in slack side of belt

We know,

$$2.3 \log (T_1/T_2) = \mu \cdot \alpha$$

$$\log (T_1/T_2) = 0.25*3.19/2.3$$

$$T_1/T_2 = 0.238$$

$$T_2 = 100/0.238$$

$$T_2 = 43N$$

We know that the velocity of the belt

$$v = \pi d N / 60 = \pi * 0.064 * 600 / 60$$

$$v = 0.497 \text{ M/s}$$

Power Transmitted belt

$$P = (T_1 - T_2) * v$$

$$P = (100 - 43) * 0.497$$

$$P = 29.32 \text{ Kw}$$

Design of belt is safe to transmit power 29.32 &

Diameter of Pulley 64mm & 32mm

Design of Flat Pulley

Selection of material cast iron pulley.

1) Dimension of pulley

Diameter of pulley D may be obtained either the velocity ratio or centrifugal stress.

We know,

$$P = \text{density of rim material} = 7200 \text{ kg/m}^3 \text{ for cast iron}$$

$$V = \text{velocity of rim} = \pi DN / 60$$

D = being the diameter of pulley, N = Speed of the pulley, D = 64mm, N = 600rpm, Width B = 1.25b

According to IS (2122) width of pulley is fixed is given table

Standard with of pulley

Belt with mm	Width of the pulley
125(125-250)	13/25

The thickness of pulley rim D/300+2mm to D/200+3mm for single belt and D/200+6mm double belt

Power transmitted P = 2828KN, N = 6000rpm, D =64mm, N =4, -b = 15 N/mm²

We know that

Torque transmitted the pulley

$$T = P * 60 / 2\pi N$$

$$T = 28.32 * 10^3 * 60 / 2\pi * 600$$

$$T = 1.601 \text{ NM}$$

Maximum bending moment per arm of the hub

$$M = 2T/N = 2 * 1.601 / 4 = 5305 \text{ N-MM.}$$

$$\text{Selection module (Z)} = (\pi b_1)^3 / 8$$

We know that

Bending moment £b

$$\text{£b} = M/Z$$

$$15 = 530.5 / \pi / (\pi b_1)^3$$

$$(b_1)^3 = 530.5 / \pi * 15$$

$$(b_1)^3 = 2532.9$$

$$B = 13.62 \text{ mm}$$

$$A_1 = 2 * b_1$$

$$A_1 = 2 * 13.62$$

$$A_1 = 27.24 \text{ mm}$$

The major axis will be in the plane of rotation which also plane bending. So that design of flat pulley is safe.

CAD MODEL

The first step for any project is design. For design we selected the proper dimensions for all 7 faces. We created model of our project on computer with the help of solid edge software. By the above model we got clear idea about the shape of the project.



V. WORKING

When the coin is inserted in the machine through the coin hole, it goes to the main circuit through guide way. It gets stable in the circuit on the collector entry door. The circuit gets completed and conveyor starts moving forward till the product fell from it. As product falls it strikes the collector switch and collector door will opened after that the coin goes to collector. The circuit in the absence of coin results the stucking of conveyor. And the product will go to receiver.

VI. RESEARCH METHODOLOGY

Design Specification

Input: 10 Rs Coin

Output: product

User interface:

Buttons:

A, B, C and D for product selection. These buttons will be used action buttons.

Methodology:

Project developed is not an easy task. It requires thought study of the various component and their outcomes. The project is effective only if it can fulfill the objective that is aim to provide. The project is implemented using various that are organized in a specific way so that the device is small and portable. Each component has a specific function to perform. Our project is basically divided into two parts mechanicals, electronics.

The project consists of various elements regarding electric and mechanical engineering. Such as

DC motors

Conveyors.

Pulleys.

9 Volt adapters

VII. CONCLUSION

In this project, firstly we identified the problems of some electronic part. That problem then sorted out by guidance of our project guide and some research. As our branch is mechanical Engineering. We knew few about electronic circuit. But we have done it with the help of internet. It was very challenging for us. We have learnt a lot about Vending machine.

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