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Automatic Vending Machine Prototype Model

M. Jasmin*, S. Beulah Hemalatha, R. Udayakumar
Department of ECE, Bharath University, Chennai.
***Corresponding author: E-Mail: rsukumar2007@hotmail.com**

ABSTRACT

Portable vending machines are very useful devices for dispensing small, easily available and necessary equipment's for the use of common man. The aim is to construct an automatic vending machine prototype model, which can be installed in schools, colleges, hospitals and other public places to dispense pens, pencils, and sanitary napkins during needs with appropriate mechanical designs for items collection. Also microcontroller circuitry for coin checking, validation and dispensing for items is to be proposed and implemented in real time.

KEY WORDS: Vending Machine, Equipment's.

1. INTRODUCTION

General: Automatic vending machines are not that common in our country. Hence implementing such a machine in real-time will be of great use for people. The advantages of the machine is it requires no man power, consumes less power, occupies less space, maintenance free, simple in operation and portable.

The objective is to develop a vending machine prototype model for vending the items by credit or transaction. The availability of the items is also checked. It finds its application by mainly students and common citizens in public places.

Literature Survey:

Vending Machines: Candy machine is a coin worked machine for offering stock. Candy machine gives different item, for example, snacks, refreshments, water, tickets, and others item. Candy machine likewise does not require administrator or laborers for running it. Candy machines can be utilized both for offering an item (stationary, cool drinks, etc) or offering an administration (tickets, coupons, and so forth). After installment has been made the machine will administer the concerned item or administration (Ana Monga, 2012; Ankush, 2012; Shatrughan Modi, 2011; Biplab Roy, 2010).

Around 215 B.C, the first candy machine is accepted to have been developed in Alexandria, Egypt. The mathematician Hero presented machine that acknowledged a coin and afterward apportioned a settled measure of blessed water. After that, in A.D1076, candy machine was overhauled by Chinese designers who added to a coin-worked pencil merchant (Subramoney, 2007; Kaushal, 2012; Karthik, 2013, Jasmin, 2015).

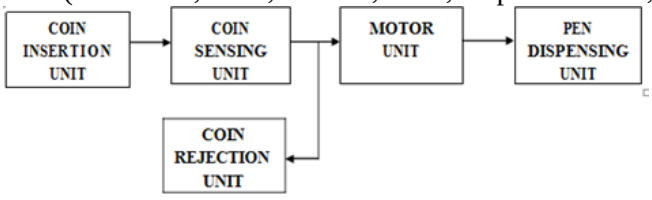
Mid 1880s, the first present day coin-worked candy machines apportioning post card were presented in London, England. The primary candy machine in the U.S. was implicit 1888 by the Thomas Adams Gum Company. The candy machine administered a bit of tutti-frutti gum.

In late 1920 and 1930, costlier items were presented. Sample being soda pop and nickel-confection. In 1946, espresso sellers were produced and took after by refrigerated sandwich merchants in 1950.

These days, numerous things can be found in candy machine, for example, dress, milk, cigarettes, postage stamps, cologne, baseball cards, books, live draw, comic books, and some more. Some hey tech candy machine can apportion hot nourishments, for example, pizza, popcorn, French and burger.

A couple of frameworks utilized an exploratory Java and an exceptional reason equipment interface to control a Pepsi B candy machine over the World Wide Web. This framework permits clients with prepaid records to distribute a pop from the Pepsi A machine (with no coins or bills) utilizing a web program, for example, Netscape or Internet Explorer. Anybody with a web program might see whether any of his or her most loved soft drinks are left in the machine. Indeed, even remote candy machines were planned and executed.

In our proposed framework, the candy machine is intended to distribute vital things. The advantage of the framework is its reduced size and is anything but difficult to introduce. It has great surface shower to guarantee rust counteractive action in the machine. Primary component of it is innovative apportioning system by reversible upset of the belt. It can acknowledge one division of coin every time, except can acknowledge 1-6 pieces by setting. High volume rechargeable battery or 8pcs size D battery are utilized for force supply and along these lines help in decreasing the utilization of power (Philomina, 2014; Karthik, 2014; Gopalakrishnan, 2014)



System Block Diagram:

Coin Insertion Unit: A provision for insertion of coin is made at the top of the machine. The coin slot is made in such a way that it can accept only a particular type of coin hence it will not accept any other denominations. Once a coin is inserted it is directed through a pathway of similar size (Saravanan, 2014; Vijayaragavan, 2014).

Coin Sensing Unit: As the coin moves through a path, it is made to pass through an Infra-red sensor. When the light ray emitted by the Infra-red sensor source is cut while the coin passes through the ir sensor, it generates an output that actuates a stepper motor.

Coin Rejection Unit: There are two specific cases when a coin rejection takes place. First case, a coin is rejected when no output is generated from the sensor which in turn rotates a stepper motor to 360° in anti-clockwise direction so that the coin is sent to coin rejection area. Second case, a coin is rejected when a pen is not dispensed or unavailable.

Motor Unit: The motor unit is dependent on the coin sensing unit. Motor unit works only if there is a valid output from the coin sensing unit is obtained. If a valid output is obtained from the coin sensing unit, the Stepper motor which is coupled to a gear system is made to rotated 180° which in turn rotates the gear to 15° in order to dispense the item (Karthik, 2013; Kanniga, 2011, 2014).

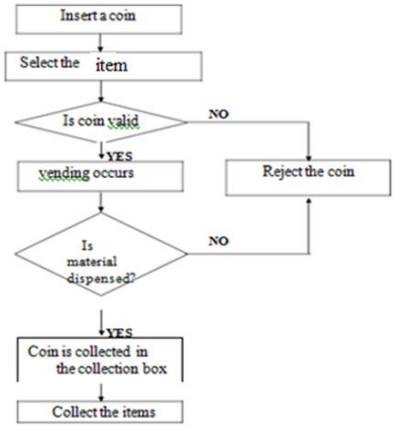
Dispensing Unit: Once all the above units work properly and efficiently, the item is dispensed and can be collected from the collection area.

Appearance of a normal vending machine

Operation: Fig 2 shows the picture of a general pen vending machine. During the loading of the products into the machine, the products are placed on the grooves of column one by one. After a column has been loaded fully, mechanism have been provided to ensure that the machine operates with the full load of pens and indicate the same. Press the button for running the column on. PCB and the empty back column will come to the front.

As soon as the coin is inserted, it checks for the validity of the coin and the availability of the product. If the coin is invalid it is rejected out or even if the item is sold out it is rejected. If the product is available, the product is dispensed out and the coin is collected in the coin collection box. This machine is operated by battery. So the maintenance of the machine will focus on the battery because it is critical for the functionality of the machine. Every time when adding products or collecting coins, the machine should be checked by doing a few purchasing operations.

Flow chart:



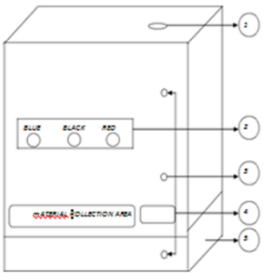
Working: The user can drop a coin through the slot provided and press the button of the required item. After the insertion and sensing of the coin, execution of the process starts. A sensed coin waits for the entire process to be completed before getting deposited into the collection box. An un-sensed condition ensures that the coin is given back. The process ends with one item being dispensed to the collection area, the rotation mechanism of the stepper

motor and the associated load ensures that proper operation takes place and the item is vended properly.

The item as it gets dispensed is made to pass through the infra-red sensor. As the object cuts the infrared rays, we can say that the process is complete.

If the item is not dispensed out and if there is no obstruction sensed by the sensor, then it is assumed that there is some problem in the system. In that case, the control goes to the coin stepper motor and coin is sent to the rejection area.

Mechanical structure:



Mechanical structure

Shows the mechanical structure of the vending machine. The prototype model is implemented by the help of the mechanical design setup. The various blocks present in the design are mentioned below.

Blocks

- Coin insertion slot
- Selection of the item
- Lock and key
- Coin rejection slot
- Control unit

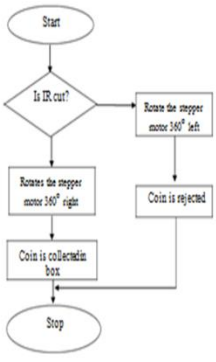
Coin section: The coin section consists of three units – coin insertion unit, coin sensing unit and the coin rejection unit.

A coin slot slot is provided at the top of the box to insert the coin. This coin slot will accept only one type of coin. Subsequently the coin will be directed through a pathway of similar size. The machine will not accept other denomination coins. The coin would be rejected if the pen is not vended properly.

The purpose of the infrared sensors is to check if the coin is dropped into. Its structure consists of a flat plate to hold the inserted coin. So when a coin is dropped on the plate, then the infrared signal is cut and immediately an output will be generated and thus the sensing will be done.

The rejection unit consists of a stepper motor which is coupled to the flat plate. The stepper motor enables the plate to rotate either left or right 90^{o} and return back to its position. So when there is change in resistance, it checks for the range.

Flow chart of coin section:



Flow chart of coin section

The coin section functions under

Two main conditions:

- If coin is valid Stepper motor rotates the COIN STEPPER MOTOR 360 degree RIGHT. And the coin gets collected in the drop box.
- If coin is invalid Rotate the COIN SENSOR MOTOR 360^{o} LEFT, where the coin will be rejected through the rejection bay.

Dispensing Unit: The dispensing unit consists of conveyors for holding the items, a gear to rotate, stepper motor and infra-red sensors. 3 conveyors will be provided for 3 different items separately. Material used is rubber. Capacity provided for items are 50 items each.

Metal Box: This sheet metal box is used to hold all the mechanical and electronic components intact. A lock is kept for safety purpose. A control unit is provided separately at the bottom to hold all the electronic components which include 89c51 development board, stepper motor, drivers and transformers.
Conveyors: Conveyors are used to hold the items. They are made up of rubber material. A guide is provided along the sides of the conveyors such that item is held in position and not rolled. A opening is made at the bottom of the guides so that only one item is dropped out at a time.
Rollers: A Conveyor is mounted on top of rollers. A bearing system is used for rotating the conveyors as per the specified angle. Material used is nylon for light weight purpose.
Gears: Gear is made up of nylon. It is used to propel the load from the stepper motor to the rollers.

2. CONCLUSION AND FUTURE SCOPE

The proposed system is the design of prototype model for an automatic vending machine. The controller part was tested and it was found that automatic vending machine prototype was working according to the specifications for which it was designed. The prototype model was designed for the implementation of the mechanical structure of a vending machine which finally results in vending a item upon the insertion of the coin. Implementation of this machine in schools and colleges will help the students to take the items whenever they are in need of it. Coins were inserted and items were vended successfully. In future, vending machines of maximum accuracy and efficiency can be achieved with better design and faster control equipment's.

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