

Vending Machine

Vending Machine: Technology review and Types

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ABSTRACT

Vending machines have been around for a very long time, which is a mere indication of its utility in our day to day life due to its efficacy and feasibility. Lot of advancement and upgradation has been made in the vending machine to provide convenience to the customer and to become more and more a user friendly machine. The first modern vending machine were developed in England in the early 1880s but in the the first century of Roman Egypt the very first vending machine can be traced, which was more like what we can call now as a dispenser. The popularity of the vending machine have been growing since then. If we consider today scenario, the booming of the vending machine industry is positively going from strength to strength which in itself is a solid indication that we are seeing more interest and investment in this invention purely for the fact that it has not only continued to prove its value but that it is continuously exceeding the expectations that upon it. It may seem like quite an interesting thing to say considering this is just an invention that is quite simple in its nature, however the vending machine is powerful because it is convenient and it is efficient and for that reason it is continued to gain further interest and investment. Thus by seeing the advantage that a vending machine can provide, by considering all the facts and the advantages of the vending machine ,the primary aim of this literature review is to give a broad overview of different vending machines and the mechanism behind it.



Introduction

A vending machine is an automated machine that offers the customer the desired product and which doesn't need any human intervention. It is used to sell a plethora of products to the customer. The vendee inserts currency or credit into the machine and the product is issued. The machine is controlled through a control system which provides a main module, a payment system, a user interface system, a product extraction system and a communication system. The designing of the vending machine doesn't need any high maintenance and it can be placed anywhere from schools to hospitals. The development of the vending machine focuses on the customer to give them a user friendly experience. And the material required for this system was environmentally friendly and the safety and security of the machine is taken care of(1)

Vending machines are used in different markets and in a lot places for serving products. The American Association NAMA (National Automatic Merchandising Association) states that "vend is the delivery of a single unit of merchandise"

Designing a vending machine apart from the technical functions (power, water supply, distribution and payment unit) and the marketing-relevant aspects (e.g. accessories like spoons, cups, serviettes) it is very important to see the user comfort. The payment system, distribution comforts and handling features should be the first priority.(2)

Automatic vending machine is not very common in our country so implementing such machine will provide individuals with the products which they desire at ease. The items or the products in the vending machine can be received through cash

or cashless payment option available to the user. Such advancement in machine will be simple and easy in operation and portable with less consumption power(3) Technology has become a part of the different aspects of our lives as it makes most of their work faster and easier. One of the fast-paced technologies is the vending machine. It is a machine that dispenses products automatically, products such as beverages, tickets, snacks, etc., by inserting coin in the machine. Vending machines appear in different forms and functions. These are generally used in public and private areas such as malls, markets, offices, schools etc. In the recent time use of digital is increasing day by day due to their accuracy and feasibility. Due to time saving feature people use vending machine in busy area like airport, bank, office, etc. This system is portable, affordable, consumes less power and can be made easily available so that the user uses this system whenever and whatever. Start thinking about what machines with need to purchase and begin to price them, new and used. This helps budgeting so, when the time comes to start buying machines, user well prepared(4)



Concept of vending machine

Vending machine is a magnificent which works without any human intervention. It had low maintenance and is user friendly. for various functionality of vending machine a control system is used so that those operation sand the components fitted in the machine can work properly. the control system takes the charge of handling of the coins, mobile phone payment, refrigerator, product dispensing, etc. With all this it



can also provide smart technology such as hd touch screen and remote management device

software. It can also govern the movement of the products and the temperature system situated in the machine. Making vending machine digitized offers the user to choose for the option of paying for the product with cash or with cashless pathways which makes the entire process convenient for the user. So a flexible payment method, mobile and card swiping should be incorporated in every vending machine which is very much need in this era where from the smallest things to the biggest are been digitized. (5) Vending machines are useful for business purposes and different types of vending machines for different purpose. The popularity of digital currency e.g bitcoin ,online transactions like paypal ,etc is increasing exponentially. So if we get the products through online payments , it will be very helpful and efficient as well as time consumption will reduce. Control system is used to communicate



with various components of the vending machine and an internet connection to connect with the remote digital currency system e.g bitcoin network(6)

Automatic Vending Machine is a safe machine which ensures the payment as well as the product delivery to the vendee. It is operated to the response of the card , reads the card using the magnetic strip ensures the balance and card limit is more than the total bill amount and then if the condition satisfies it delivers the product . When the Vendee inserts the card ,then the card reading process starts and then the merchandise selection bar is shown for choosing the product or one can also select merchandise according to the stored information. Once the product is confirmed account balance and card limit is matched to the final amount to ensure the payment process. Once this process is completed and the payment is

ensured the product is dispensed and the amount is deducted from the card , if the payment is not ensured the error occurs and the merchandise selection bar appears with the error displayed on the top of the list.Automatic vending machines promote advanced payment cards as they are safe and easy to handle. Advance payment systems help to reduce human errors and efforts. It helps us to purchase goods effectively and also saves a lot of time(7)

recently the vending machine has gone to several innovation and one of them is the usage of RFID technology in it.RFID(radio frequency identification technology) is a secure approach which also reduces the manpower.RFID technique for cashless payment which is why it is being most accepted then the antiquated models of vending machine.(8)Development and installation of this system will allow consumers to use the RFID cards



already purchased and using in other payment areas e.g. in toll plaza etc. RFID technology has introduced the novel cashless payment system, and replaced the traditional cash based methods in vending machines.. WORKING : RFID is a secure and cost effective electronic identification wireless technology based on capacitive inductive resonant system. This technology incorporates radio frequency (RF) electromagnetic fields . Passive RFID battery-less package includes the RFID card and RFID reader with 13.56 MHz operational frequency. RFID card is an identification card that stores a unique serial number, consisting of a tag or transponder made up of small spiral coil shape inductor antenna and an electronic micro-chip .In addition acts as a power source for passive RFID using EM field and that's why it is a vital step in the improvement of the vending machine(9) Another innovation is the implementation of n fsm(non finite state machine) in a book vending machine.This vending machine is a multi select machine where the user has to insert the coins or the required mount to get the desired book. This vending machine then will be simulated by a vms tool. The vending machine used automata theory with the help of vas tool.By using the tool and implementing such design the efficiency of the vending machine can be upgraded and enhanced in various applications of it(10)

Vending machine which uses the IOT system avoids the misuse of the machine.Previously it has been seen that the coin which was collected by the machine was stolen.So to eliminate this the wireless technology is used.This works on the basic principle that the user have to ping the server IP address where the user will be able to

see the availability of goods and can choose the desired products.then the amount will be displayed on their mobile phone so that the payment can be done after which the server will generate the otp so that the user can type the otp in the keypad.That's how the user will gets the product.(11)

Vending machine can be used to provide different products whenever a coin is inserted but to make the process much more effective FPGA is used. FPGA based vending machine give fast response and uses less power than the microcontroller based vending machine. The main purpose is to create a vending machine which is designed in such a way to provide four different snacks or four different products and which can give change after successful trade for the desired product and also it returns money when trade fails .The main feature is its small size and acceptable power consumption. An additional feature to this vending machine is ,if it's cancel button is enter, amount will return. The FPGA based vending machine based on FPGA gives fast response and consumes less power and is very easy to use by an ordinary person. The FPGA based vending machine increases the efficiency and accuracy of vending machines. Also we can monitor the FPGA based vending machine with the mainframe computer. It has flexible and reliable algorithm which the vendor can easily enhance the algorithm for larger number of products and coins of different types(12) Vending machine is a machine which uses digital and mechanical energy in order to dispense items like medicines, food items, tickets to customers automatically on payment into slot.Payment is usually through debit / credit card .At present gold , diamonds are also sold using

a vending machine.VHDL implementation of the FPGA based vending machine is proposed on Mealy Model of Finite State machine (13)

Classification

Here we have broadly classified the vending machine on the basis of the vending machine which serves food based products or non food based products to the customer.



FOOD BASED VENDING MACHINE

1)Coffee vending machine

The convenience of having a coffee vending machine is hard to beat. With a coffee vending machine you don't have to worry about the consistency of service or how long it will take. This vending machine can be installed anywhere such as station, office, etc. but due to some underlying problems like cleaning status of machine and the expiry date of the products people aren't willing to pay for such products so the development of a smart vending machine is what is needed to provide the solution to the problems.

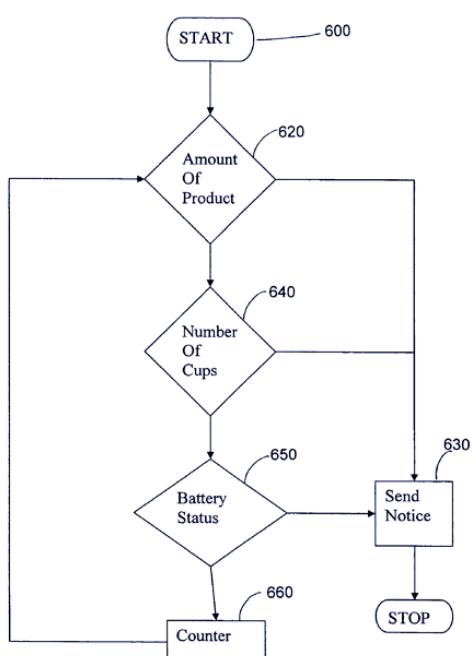
The smart vending machine is designed in such a way that the customer can order coffee via a mobile app by using RFID technology. It consists of the PIC18F877A microcontroller, temperature sensor LM35, water level BC547 sensor, RFID

reader, 16*2 LCD display, Wi-Fi module ESP8266, relay driver ULN2803 Relay driver -used to give a start to the coffee heater, coffee selector and the pump. Microcontroller PIC18F877A- read the data from the sensor. Temperature sensor- maintain the constant water temperature. A PIC microcontroller reads data from the RFID reader. The microcontroller displays this data on LCD screen and sends the data to the Wi-Fi module

ESP8266. Now The data is sent to the Thingspeak cloud. after which An android app uses the Read API key to read data from Thingspeak channel. and displays in the text window. Then we press the button which reads Prepare Coffee The app sends data on cloud where microcontroller receives it to start the process. The microcontroller first checks if water in the tank is available or not and displays water level low if it is actually low. The heater is started and when the temperature reaches 70 degree it stops the heater. After which the dispenser adds 1 spoon of coffee mixture in heated water and it reads coffee ready which denotes the end of the entire process. The primarily aim of the IoT based coffee vending machine is to make the entire process less time consuming for the customer as the customer can order the coffee according to their taste via a mobile app by the click of a button. Another aspect is the monitoring of the the level of ingredients before they get emptied in the machine which is given by a notification alert which is send to the concerned department so that they can refill it. By implementing few new technology a whole different and reliable vending machine can been made. (14)

2)Smart Water Vending Machine

Hydration is extremely vital for every living organism from birds to humans. So in this country, scorching summer causes loads of people having serious health issue due to dehydration in the body. So to aid this, water vending machine can be proved extremely useful. By using RFID technology and arduino in the vending machine, the vending machine will become more user friendly and also it will provide the user with an option of cashless or cash payment methods. The components which are used in the vending machine are connected to the arduino uno which operates at 16 mhz of clock frequency when the supply is 5V. The RFID uses the methodology, when the card is swipe automatically the required amount will be deducted and to know the availability of water in the vending machine, level sensor is used. Also to check the ph value of the water present in the machine a ph meter is also attached to the system. The smart water vending machine can be used in several places like schools, bus stop, offices, etc. The designing and implementation is such that it reduces both time and cost of the user and adopts



a new methodology of cashless payment or transaction which is a great convenience to the customer. (15)

3) Ice Cream Vending Machine

Ice vending machines are usually integrated with the beverage vending machines in the malls and other places. They make the process comfortable and simple and one can fill the drink and can have the ice simultaneously to cool the drink.

WORKING : 1. Combining the liquid to create a perfect beverage as ordered. 2. The mixture is then inserted into the mould to freeze it 3. Once it converts into ice, it is crushed into smaller pieces 4. Then the ice is ready to be mixed with the desired beverage. 5. User is then given an option to choose the type of ice 6. Accordingly ice is dispensed into the beverage and then is provided to the vendee. (27) The invention of the ice cream vending machine was one of the best, as it delivers hygienic products. The vending machine consists of machine cabinet; a door pivotally connected to the machine cabinet; a cup dispensing slot and an ice cream dispensing slot; a cup dispenser adapted to dispense a cup; a product dispensing button connected to the door, a money acceptor linked to the door; an appropriate product container connected to a freezer engine adapted to receive a product, the freezer engine having an outlet to the ice cream dispensing slot; and few more parts which contributed to the success of the machine. The soft serve ice cream vending machine includes a machine cabinet, a door, a product dispensing button, a cup dispenser, a money acceptor, a flexible product container, a freezer engine, etc. 1. Menu display 2. Choose the desired product with amount of the product 3. Choose the Flavour 4. Choose the topping 5. Make payment 6. Once the

payment is done cup is dispensed ,desired flavour is added 7. Final icecream is delivered

An ice cream vending machine was invented and it covered a lot of drawbacks like safety, hygiene, proper amount, manual errors, etc.

Ice vending machines are usually integrated with the beverage vending machines in the malls and

The process of having a drink with the preferred ice type (colourful, flavoured and many more types) is made easy and hygienic(16).

4)Automatic Chocolate Vending Machine By Using Arduino Uno

Nowadays vending machines are used to deliver



other places. They make the process comfortable and simple and one can fill the drink and can have the ice simultaneously to cool the drink

1. Combining the liquid to create a perfect beverage as ordered.
2. The mixture is then inserted into the mould to freeze it
3. Once it converts into ice , it is crushed into smaller pieces
4. Then the ice is ready to be mixed with the desired beverage.
5. User is then given a option to choose the type of ice
6. Accordingly ice is dispensed into the beverage and then is provided to the vendee.

many things, for examples newspapers, chocolates, chips, beverages, candies,etc. Normally when we insert a coin for the desired product , the vending machine does not return the change, so here the aim is to resolve this issue.

This automatic chocolate vending machine aims to launch new technology in the society . It is operated using arduino uno and radio frequency identification method to deliver different types of chocolates. Radio frequency identification uses labels or tags to identify the object. Here three processes take place : 1. Scanning of RFID card

which provide cashless payments 2. Programming unit starts here (using arduino) 3. Display information and deliver the product. Firstly , a welcome message is displayed followed by an instruction to insert the card ; once the card is inserted, it is analysed and the product list is shown ; once the product is chosen ; the motor rotates and displays the product and at the end of the process ,the vendee receives the product. When a normal coin based vending machine is used , one can get the product by inserting fake coins of the same density and size , so to avoid this arduino uno with RFID tag and reader is used here(17)



5)French fry vending machine

a french fry vending machine is a coin operated vending machine wherein it provides four different types of foodstuffs whose compartments are situated in the refrigerator chamber .there is a refrigeration chamber in the electromechanical vibrator required to tremble frozen food to the foot of opening of the respective frozen foodstuff and then it goes into the metered dispensing rotatable wheel. The frozen food is kept and also a machine is installed in which the oil is filtered.,heated,recirculated and also it is thrown out after using it for a fixed no of time.the vending machine do have a fire extinguisher which is automatically operated by a sensor .The path from the refrigeration chamber to the cooking chamber have a solenoid operated door this vending machine uses electromagnetic heating coils which are located in the heating chamber (18)

6)Tea vending machine

This smart vending machine which accepts coin as well as credit card and also provides oriental tea and it also check users health automatically and also can provide oriental medicine by amalgamating various medicine accordingly to the health of the customer.this vending machine uses a monitor which displays manual of the vending machine ,users pulse and customer heath condition and a advertising screen,also a photograph of user iris is taken and then all this information is processed.the medicine is stored and is discharge accordingly to the control signals outputted from the controller.the mixing and heating water with various oriental medicine tea is done automatically and then it is poured

into cup which is later served to the customer.(19)

7)Cigarette vending machine

Due to The ongoing demand of people consuming cigarette the vending machine especially designed to store the stock of cigarette for the customers .Inside the vending machine there are number of shafts or a number of levels present where the cigarette is arranged so the vending machine counts a total of 60 shafts.Behind the mechanism of the shafts is the electric drive motor which drives a spindle extending in the longitudinal direction of the Shaft and operates as a reduction gear drive the user selects the desired number of packed cigarette via keyboard and the delivering of the required item is done through the control signal which is obtained from the light sensor or the light barrier which is situated above the conveyor belt device.there is a clamping mechanism provided in the front side of each shaft which acts as a restraint to the first cigarette pack;(20)

8)Popcorn vending machine

This is a coin operated vending machine where a fixed or pre decided amount of popcorn will come out from the opening with the seasoning. Preferred by the customer after he or she inserts the coin in the vending machine. This vending machine has an electrical controlling circuit which will make sure that evenly heated popcorn is ready for discharge. The size of the vending machine is similar to the refrigerator. Inside the vending machine there is an unpopped corn hopper ,an oven housing,a popped corn hopper which supplies the popcorn into a horizontal discharge chute overlying in a part with a dispensing chamber which has a catch basket

under it so that the popcorn can be let out. Peanut oil and other liquid is applied to the dispensing corn with the right amount of salt for the seasoning. The unpopped corn in the hopper will get into the heated oven. which is Thermostatically controlled and then the popcorn will start popping and after the completion of process will discharge into the hopper which will lead to a metering chute where the amount of popcorn is determined in response to the coin actuation Then it will pass down to the readied cup where it will be mixed with heated oil and salt making its way to the container. And once the container is filled with popcorn the customer can take the container out. (21)

9)Pretzel stick bending machine.

This is a coin operated pretzel stick vending machine. Starting with a pretzel laid upon ribbon extending transversely there by sleeve will be rolled over the ribbon consisting of pretzels where the pretzel will be wound spirally on the sleeve. It has been said that the ribbon is wounded upon the roller as it is unwound from the sleeve which is run in a clockwise direction then inserting the spiral rod of Pretzel in the position and the roller is converted to the free end of the roller or the belt where the pretzel are laid over .Then the roller can be rotated not automatically but by using hands or manually until and unless the belt or the ribbon is stretched out after which the rear over will be placed in the position .It has been observed that the spiral roll is deprecated in diameter then the pretzel are feed outwardly because the arm which will swing to the right to maintain role of pretzel which should always be in the position and that's how the pretzel will get discharge and we ready to

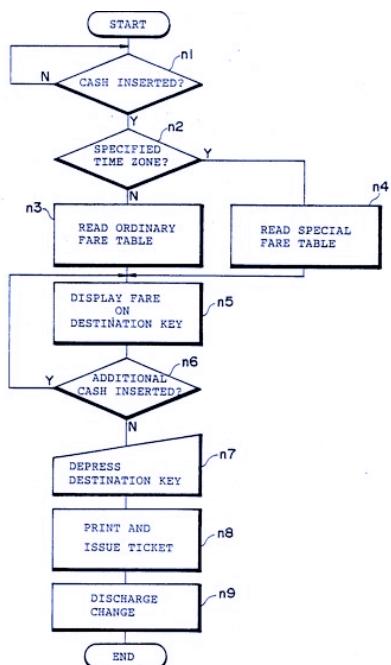


be served to the customer who is waiting at the other end to get his or her pretzel. (22)

10)Fruit vending machine.

The vending machine delivers fruit to the

chamber is present which is formed above the wall of the vending machine so as to store the fruits that can be vended by the customer. Also in this Storage chamber there are several housing for holding vertical columns of fruit in a superimposed manner. These housing have rods which are of the same length as that of the housing. There is a glass front so that the items or the fruits displayed in the vending machine can be easily seen by the customer the next is the delivery chamber which has an opening for delivery of the fruit, which will then lead to delivery tray having a bottom side and back wall and having sufficient area to received the fruit. When the Fruit is being discharged the path which it takes is a cylindrical shape with four entities receiver or opening .In this vending machine fruit Holder and supporters are located so that the edge of the fruit shouldn't come. In contact with the margins of opening to get the desired fruit this cylinder will be unlocked and is turned then the fruit in the Holder will move from the column to the delivery compartment and the customer can receive his or her fruit.(23)



11)Candy or gumball Vending machine

This vending machine vendess candy OR ball when a coin is inserted in the coin slot by the customer .Once the coin is inserted,the lever Is actuated which is then moved but behind all these activities is a pin at the end which engages the upper portion of the lever In response to the rotation of the shaft after a which a piece of gum ball or candy drops into the container but only one gumball or candy can get dispensed when a coin is inserted ,which is done when the user or the customer push down the lever so as to release a gumball or a candy.Then he or she lifts the trough

customer as per their requirement. Here a

to the full position which in turn permits the lever to snap back into the holding position (24)

12)The bread vending machine.

Bread vending machine has a coin operated system which contains a housing which includes a pair of walls which are spaced apart substantially paired and are of equal length which are then attach to a top and a bottom wall .The housing also contains several discrete spaced apart compartments where the breads are been placed. But only one food item which is packed can be placed in the compartment .Now these are sealed by a transparent door which is further associated with a handle unit extending forwardly and it is positioned so that the customer can easily grasp it. Vending machine with the coin receiving mechanism also uses a door release machine . Hence the coin receiver is situated upwardly and vv forwardly of the second pivot so when the coin is inserted then it makes the forward portion of the lever to pivot it about the pivot point which interim makes the arm to detach from the slot. In response to this the door is opened so that the customer can grab his or her desired product. (25)

13)Instant noodles vending machine

To eliminate the issue of buying instant noodles only at a given time accordingly to the stores and market opening and closing times,the instant noodles vending machine was introduced so that instant noodles can be available to the container whenever they want to have Instant noodles. Been seen as a quick snack which is consumed on a daily basis by most of the people working in call centres or having some kind of job preferred to have it during their break time.The customer has a

choice to select 4 different.flavour of noodles .The Working of this vending machine can be understood by the following steps. First and foremost,the customer has to position the cup in the rotating disk after which the customer has to choose the desired flavour of the noodles which is given in the control panel. Once these two steps are done, then the rotating desk will start to rotate automatically until and unless the second position which is seasoning dispensing is reached. After the Noodles are dispensed with the seasoning the hot water injection which makes the Internal part of the mechanism comes into play. The front panel have opening which is required for LED indicator,pushes button and position of the cup on the disk. The back panel have the opening for the Canister placement and maintenance. Now the top cover,located at the upper middle portion of the panels has an opening for the water tank. Once this process is done, the noodles are ready to be served to the customers. (26)

14)Hamburger vending machine.

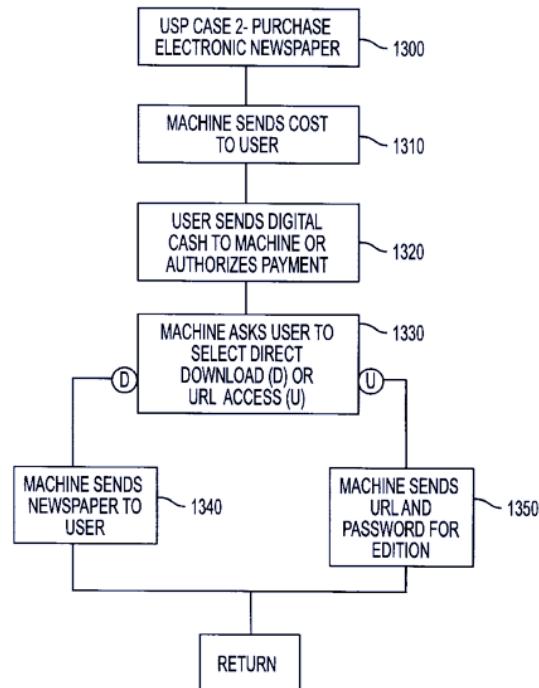
A vending machine which can receive the amount in the form of coins and can also as a card payment method is solely designed to give hamburgers to the customer automatically and therefore is ready to be served. This vending machine consists of a cooking oven where each piece of meat is cooked and the meat is taken from a reserve of deep frozen pieces of meat. Also, there are different stations in the vending machine which perform different mechanisms. The first station supplies the first series of Half rolls of bread where this half roll will have a single piece of meat which is taken from the oven so this half roll off bread are laid on the conveyor. Now, this second station will deliver the second series of half rolls of bread which is

required to cover the meat in the bread where the meat is already present in the first half roll of the bread. The last station is the wrapping station where each Hamburger is wrapped and the hamburger is wrapped In between the two sheets or film of plasticised paper forming a pouch shaped which is open on one of the sides. Here a program is said to be created to provide the customer to choose Ingredients that they want to have in their burger. After choosing the desired ingredient the hamburger will be made available to the customer. (27)



15) Snack and beverages vending machine. This vending machine co- Dispense both snacks and beverages. It contains 2 containers, one for beverages and the other for snack. These containers, which are empty, have nitrogen gas so as to remove any oxygen present in the container. Then it is filled with snacks which are then further sealed with a lid. This is done in the sealing Station. Also this vending machine has two refrigerators to store both the items and both the storage. size is

the same.(28). When the customer selects the particular item, then the dispensing door opens for a certain amount of time. This mechanism includes .solenoid which will receive an electrical signal, after which the door will open. This



solenoid as stated above, has an arm which will move in a particular direction when electrical signal is received. So when the customer selects an item, the electrical signal will supply power to the dispensing gate to the compartment where the product is placed, which in turn will supply power to the solenoid. Once The dispensing gate is opened the containers move from the stack or storage rack and will drop into the chute so that the customer can take the product. (29)

16) Frozen food

Automatic frozen food product vending machine is from the automatic vending machine family. It aims to dispense soft confectionery products such as aerated ice cream,custard,frozen yogurt,sherberts, sorbets or other similar frozen food products. It

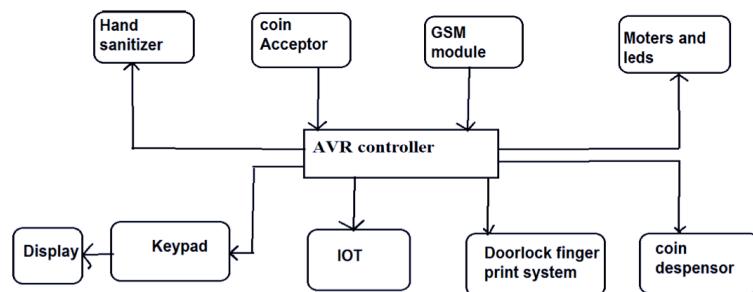


Figure 5. Percentage Accuracy vs Type of Vending Item

works pretty similar to normal vending machines i.e it has a storage hopper, a bag to store the product, reservoir, etc. It aims to store multiple products and put at least one topping efficiently.

The process is as follows : 1. Processor and Interface : it consists of a processor which is a combination of container data, product selection, container size selection, fill position determination, time, container size verification , movement prevention, accumulated steps and few

more things. 2. Choice is asked for product, flavour and amount. 3. Payment is asked and after successful payment the process of preparation starts. 4. Proper container selection takes place



and is placed on the movable platform 5. Then the container reaches the fill department through the movable platform. 6. Then it is filled according to the order . 7. Topping is applied according to the order 8. The product is dispensed to the user. 9. The moving platform comes to its home position. (30)

NON-FOOD BASED PRODUCTS

1)Bag vending machine

Bag vending machines are used to provide bags to the vendee once the desired payment is done. The vending machine is a trusted technology for business and retail development. Used for keeping products in organized way & easy to operate. This vending machine dispenses bags with bail handles. Bags are placed over a vertically extended shaft and a mastering plate is placed at the top so the only one bag will be dispensed at a time. The mastering plate which was placed is a coin controlled type, so as the desired money is inserted the bag is delivered to the vendee. Once the bag is dispensed the whole system come to their home positions. It makes it easy to organize, sell and earn profit 24/7, especially without any man-power. It supports large product quantity space, accommodates most of the products in the market, with secured way of purchase and income chain. (31)

2) Hand lotion dispensing device

Vending machine makes work easy. Hand lotion dispensing devices are used at a lot of places like near swimming pools, rooms, parlours, washrooms, etc. They provide untouched lotion. A hand lotion dispensing device, have a coin slot formed therein, a viewing window and a lotion opening, the viewing window comprises of a substantially elongated slot. A transparent container of hand lotion having an opening and then the container is positioned at the viewing window to permit visual observation of the level of lotion in the container, should have a valve at the opening of the container for controlling the supply of hand lotion from the container via the opening; upon the supply of a

coin lotion is released. The principal object of the invention is to provide a coin-operated hand lotion dispensing device for dispensing hand lotion in public places conveniently, in a sanitary (32)

3) Slant shelf magazine for automatic vending machines

This invention belongs to the vending machines family and more particularly to improvements in slant shelf type magazines adapted to deliver stored articles to a vend mechanism for releasing and delivering unitary items upon customer selection. A slant shelf magazine for automatic coin controlled vending machines. Items gravitationally fed from plural, parallel, horizontally inclined superposed storage racks fall into a vertical drop chute located opposite to the lower ends of such racks. The drop chute communicates with a horizontally inclined delivery chute having the vend mechanism at its lowermost end for releasing articles one-by-one to a discharge hopper upon customer selection. The delivery chute is oppositely inclined from the storage racks and is joined to the drop chute by an curvilinear guideway formed to reverse the gravitational movement direction of the articles prior to entry into the delivery chute for purposes of reducing the load on the vend mechanism. This invention provided an improved slant shelf magazine structure for use in automatic vending machines which dispense generally cylindrical articles. It comprises a rigid deflector plate interposed in the path of vertical movement for articles gravitationally descending in the drop chute. (33)



4) Solar Powered IoT based Intelligent Sanitary Napkin Dispenser

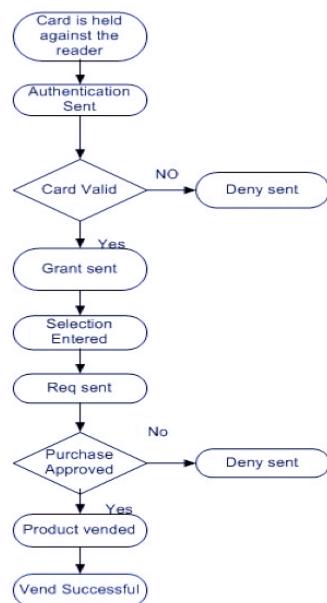
The main motive behind the sanitary napkin machine is to save the women from getting affected by uterus cancer and toxic shock syndrome (TSS). This will help them to safeguard themselves from using a single sanitary napkin or tampons for a long period of time. They will have the immediate access to the sanitary napkins whenever they're in need of it and this machines can be placed anywhere from schools to offices. The IOT based sanitary napkin machine is controlled by the PLC where the machine can work with both cash and RFID card. This will provide the user to choose the option which ever seems to be convenient to them. This machine works on RFID technology. Whenever a user inserts a coin or sipes the RFID card. The sensor which is called the IR sensor will detect it and will send the signal to the plc. Now the PLC will switch on the relay which will switch on the motor. The

motor will start to rotate the steel spring driver and the napkin will get dispensed. Once the napkin gets released the count of the napkin variable will be updated on the PLC. Components used - battery, IR sensor, RFID reader, PLC, spring mechanism, relay. The matter which has been discussed is immense importance to each and every woman. The women hygiene is something of utmost importance. The RFID technology based sanitary napkin dispenser is the solution to the mainstream problems the women are dealing with. Rack and pinion method can be used so that frequent loading of napkins can be avoided. (34)

5) Smart Newspaper Vending Machine

To pacify the need of newspaper, generally in the morning hours, newspaper vending machines are installed in the places like bus stands, schools, college and railway stations where the demand is more. The automation in this

vending machine is to make the user experience better than before so more upgraded technology is used in the vending machine nowadays. To make the vending machine work in a smart way methodology of mechatronics is been used. Components used-Microcontroller (MSP430G2553), Transformer ,DC Motor, Slider, Power supply board, Relay Board, RFID Reader, LCD Display and Ultrasonic sensor. The user has to scan the RFID tag using the reader after which the controller authenticates the card and checks for the subscription. The motor rotates and the slider turns on to push the newspaper as per the program used In the controller. The newspaper is send to the outlet for the user to receive it after



which
the
slider
is
driven
in the

reverse

direction and the motors connected to the up and down rods will be driven in forward direction . This vending machine uses automaton which works on mechatronics which delivers the newspaper with digital transaction making. Thus making it a smart newspaper vending machine.

(35)

6) Hand sanitizer

<https://irjmets.com/rootaccess/forms/uploads/cashless-payment-vending-machine-with-automatic-hand-sanitizer.pdf>

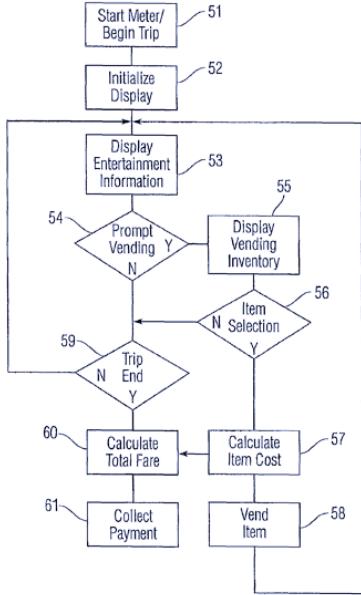
Number of sensors are connected to the AVR controller.

Hand sanitiser system includes : ultrasonic sensor and servo motor

Hand sanitiser system is for the user to clean hands before using the machine. The sensor is on , when the use puts hands in front of the sensor ultrasonic waves are reflected to the Rx of ultrasonic sensor at that time servo motor is rooted and spread sanitizer liquid. Then coin acceptor accepts the coin. The machine also accepts the online payment. LCD display shows the number of that product which is selected by the user and keypad and display is used to type the number of product to dispense from the machine. GSM module is used for the accepting the online payments by inserting a gsm sim in that module.



Figure 1. Drinking water vending machine.



After the college liberty provide books on at the own working hours i.e 10 to 5 which is only 7 hr a day so books to the students will only be issued during this hours. Availability of books make access to the information which should not be limited by any time limits.

So, to over come this AUTOMATIC BOOK VENDING MACHINE was invented.

In this project 89S52 microcontroller is used . It is programmed using keil Software. Which provide effective environment for performing the task.

proper selection of product the motor is turn on for few milliseconds till the product is despensed. These system works once user submits money and shopped items or products with no. , machine calculated the produced cost , if it matches the amount inserted it dispenses the product, if not then machine returns the excess amount in coin format . IOT finds the machine that sells product per day and save data on server by IOT (Internet of things). Door is locked and opens with the owner's dingerprint which is already stored and allows the owner to add items; it also saves all the fingerprints of users but don't unlock with those fingerprints.(36)

DISPENSER BOX is made of steel cabinet which hold the delivered books. Stepper motor is used tp side in the books in to the dispenser box. Security flaps at the opening of the dispenser box are present.

User authentication is depend on the application of the machine i.e where the machine is placed if it is to be placed at book stores then it is not important to identify the user just need to vend the book. But if the machine is to be placed in a library machine is needed to be filled with library data that helps the machine to identify the user, there are several technologies to identify the user one most common is Login Id and Password. Library provides each student with a unique id and password so they can get access to the machine by logging in.Process : Initialise the machine then select the book. The selected book and other details appear on the LCD display. User authentication process starts then, if the entered details are correct and valid then book is dispensed , if not permission denied appears. (37)

7) Automatic book vending machine

https://www.ijert.org/admin/papers/1523269397_Volume%205%20Issue%204.pdf

Students who live at college hostels need books any time irrespective to the library time and



8) Touch Screen Based Automated Medical Vending Machine

A vending machine can be used for several purposes, one of such purpose is to provide the people with medical help in remote places where the availability of hospital, medical stores, doctor is almost null. The main focus will be on the development and implementation of a touch screen vending machine using IR standard touch technology which will work as an automated

emergency kit providing -Ambulance Facility, First Aid Facility, Direct Calling Facility, Dynamic GPS ,Smart Card Facility and Restocking Medicine Alert. The methods to access the vending machine is very easy for the user to understand. First and foremost the vendee has to swipe their card so that the machine activates and now comes the role of touch screen where the vendee has to submit their disease symptoms on the screen. Now the medicine is decided and the vendee will be given a coin similar to a token which they have to put in the particular medicine box area after which they will receive one tablet from the box for that particular symptom. Microcontroller- To drive motor circuit and motor ,take out medicine, communicate with pc and update medicine count MAX 232- make microcontroller logic levels compatible with serial port of PC. Motor Driver-drives DC motor depending upon signal received from microcontroller. Global System for Mobile Communication (GSM): To send a message to respecting authority about refilling the tablets and if there is any emergency then the message is been send to the respective authority. Also if the doctor is needed to any Patient it used to send message to respecting authority. Global Positioning Systems (GPS): To locate and display on Google map about nearby Hospitals and ambulance. Power Supply-to supply power. HARDWARE-Power Supply, AT89s52 Microcontroller Board ,LM324 Comparator , MAX-232 Serial Communication , L293 Motor Driver and IR Sensor. The vending machine is solely used to aid the people living in remote places to get the proper medical facility by the designing and implementing of touch screen

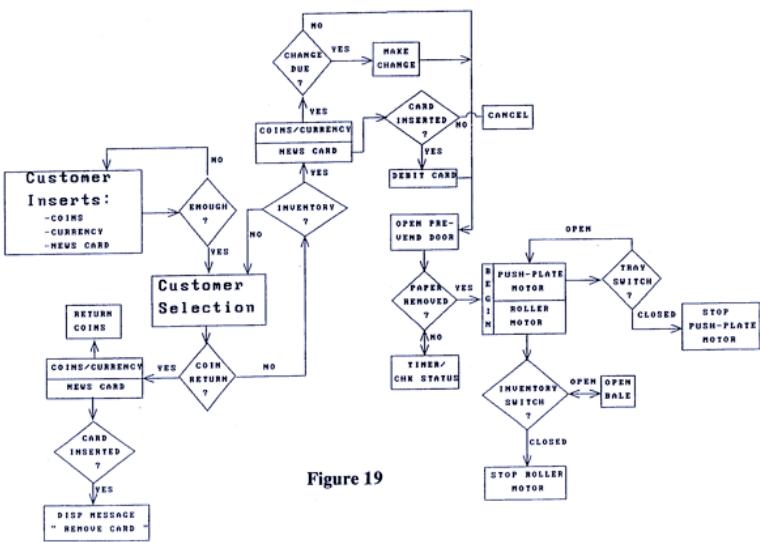


Figure 19

based automated medical vending machines using IR technology. (38)

9)Development of Reverse Vending Machine (RVM) Framework for

Implementation to a Standard Recycle Bin

Managing waste has always been a major issue not only in India but also in other countries. The risk of handling it inappropriately is high and can be proved as deleterious for our environment and also the living organisms. So an effective way to solve this problem is through the RFID technique used in vending machine. The reverse vending machine is a new concept so as to conduct the waste management process in a proper way .the machine will reward the user for every item they despise and will encourage them to take up the action regularly . The machine, on collecting any item which is disposed, it gives the customer a deposit or a refund amount. Instead of the user putting in money and getting his desired item, a BPU is situated which have two main parts one is mechanical and the other is electrical. The working is very easy to understand ,the user first have to

open the bin lid and then dispose the waste item there and eventually touch the point card to obtain the redeemed point, this waste item is been sensed by the sensor by evaluating all its properties after which it calculates the points and displays the amount to the user. To get all the information the user has to touch the authority card so that all the information can be transferred and the user has to do it one more time so that the information is uploaded in the centralized server. Implementation of such system

regulated by the local municipal can prove to be fruitful .This is an effective way to manage the waste where in return of this action the customer will get the redeemed points. This makes doing the things which are right for the environment easy and fun .This approach can be employed and encourage for the very well being of our planet. (39)

10)Design of automated medicine vending machine using mechatronics techniques

In this modern world, the use of medicines is increasing rapidly. This machine has plurality in its chambers to deliver different types of medicines as per the need of the vendee. Here also the prescription is required to get the medicines , so that medicines will only be used in the correct way and by the correct person.

Major components are:

1. a scanner to take the input from user
2. a system that includes servo motors for dispensing the medication
3. large storage space to store the pills
4. sensors to detect the motion of pills

5. an inventory monitoring system to keep track of the storage(also takes care of the expiration of the products)
6. an industrial standard vertical foam fill machine to pack the medication separately
7. a non-contact laser inkjet printer to print the description which includes the time at which the medicine must be taken.

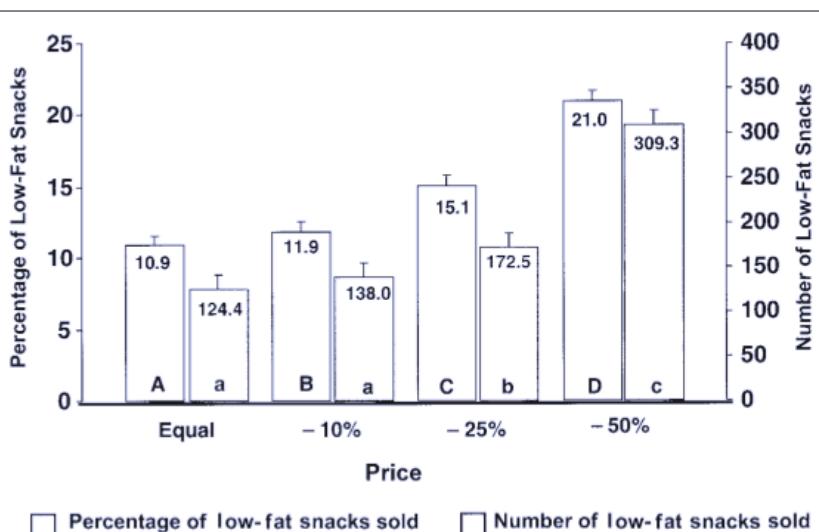
WORKING :

1. The user has to insert the printed prescription
2. Prescription is analysed, dose period is asked and number of times a day and how many are few more questions which should be answered manually.
3. Payment is asked (A money transfer system is provided to receive money from the user

loaded with a new batch of pills, it is done manually

5. The servo motor is placed at the bottom of each division of receptacle which does the work. Each division of the receptacle is angled upward from the upper mouth, so that the pill dispensing end is positioned above the input and the pills that are fed through the chute move upward against gravity
6. The infrared slot sensor placed adjacent to the servo motor makes sure that one pill is dropped per half rotation of the carousel disc.
7. The signal from the sensor is used to activate the packing mechanism, track the flow of pill and is also used to maintain inventory of medicines.
8. The pill is taken from the receptacle to the packing area through the feed chute.

9. The medication is packed in an aluminum foil bag using an inbuilt smaller version of an industrial standard vertical



Note. Different letters within each set of bars (white, shaded) indicate significantly different means according to post hoc comparisons ($P < .05$).

FIGURE 2—Percentage of low-fat snacks sold and total number of low-fat snacks sold per machine per treatment period, by price reduction condition: CHIPS study, Minneapolis-St. Paul, Minn, 1997–1999.

for the medicine via a debit or a credit card.)

4. The pills are put into the receptacle as a whole bunch. When the receptacles are

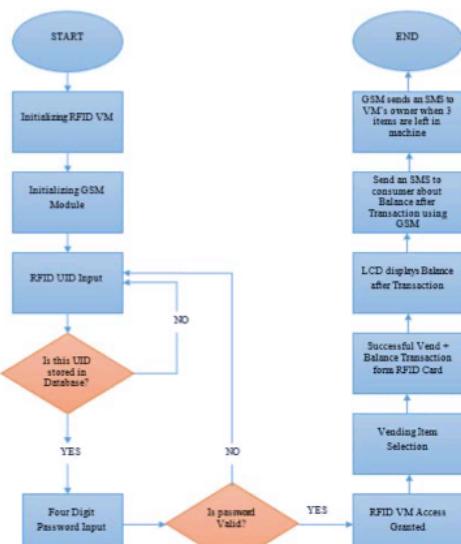


Figure 2. RFID VM Security System Flow Chart

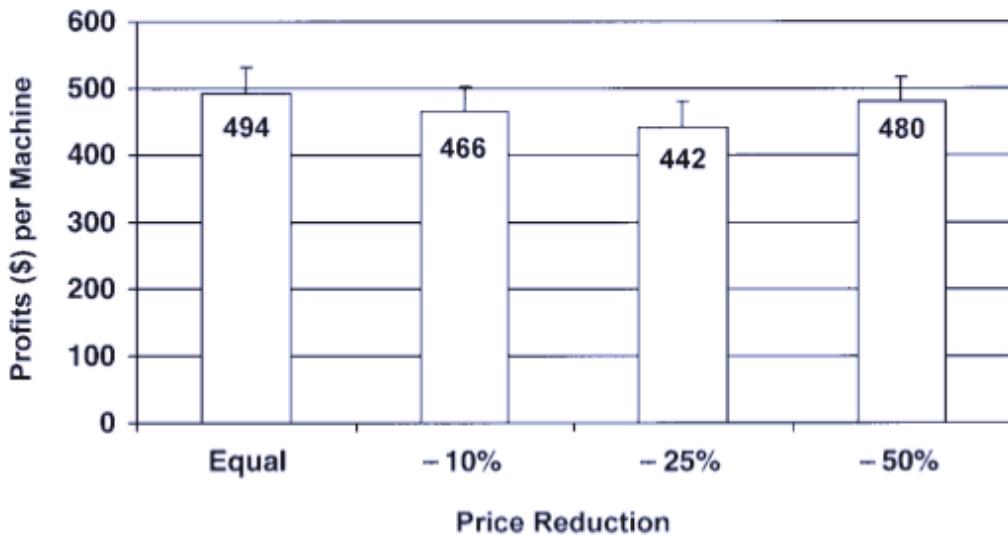


FIGURE 3—Profits in dollars (price minus cost) per machine per treatment period, by price reduction condition: CHIPS study, Minneapolis-St. Paul, Minn, 1997–1999.

foam fill machine(Aluminum foil keeps out moisture, microorganisms, light, oxygen and other gases.)

10. Once the process is over, the dispatching door is signaled by the microcontroller to open through which the user can take the medicine that is packed as per the request.This vending machine looks after the security of the people by scanning and analysing the prescriptions and giving proper medicines to the proper person and the process is also made easy and efficient.
(40)

Summary of the classification of vending machine

PRODUCT NAME	PRODUCT NAME	PRODUCT NAME	PRODUCT NAME
<i>Coffee</i>	<i>Food Item</i>	<i>RFID ,IOT</i>	<i>Cashless via a mobile app</i>
<i>Water</i>	<i>Food Item</i>	<i>RFID</i>	<i>Both Cash and cashless</i>
<i>Ice cream</i>	<i>Food Item</i>		<i>Both Cash and cashless</i>
<i>Chocolate</i>	<i>Food Item</i>	<i>Arduino uno</i>	<i>Coin operated</i>
<i>French Fry</i>	<i>Food Item</i>		<i>Coin operated</i>

<i>Bag</i>	<i>Non food item</i>		<i>Both Cash and cashless</i>
<i>Hand lotion</i>	<i>Non food item</i>		<i>Coin operated</i>
<i>Magazine</i>	<i>Non food item</i>		<i>Both Cash and cashless</i>
<i>Sanitary napkins</i>	<i>Non food item</i>	<i>RFID,IOT</i>	<i>Digital Payment</i>
<i>Newspaper</i>	<i>Non food item</i>	<i>RFID</i>	<i>Digital Payment</i>
<i>Hand Sanitizer</i>	<i>Non food item</i>	<i>IOT</i>	<i>Digital Payment</i>
<i>Book</i>	<i>Non food item</i>		<i>Both Cash and cashless</i>
<i>Medical Products</i>	<i>Non food item</i>	<i>GSM,GPS</i>	<i>Digital Payment</i>
<i>Recycle bin</i>	<i>Non food item</i>	<i>RFID</i>	<i>Digital Payment</i>
<i>Tea</i>	<i>Food Item</i>		<i>Coin as well as credit card</i>

<i>Cigarette</i>	<i>Food Item</i>		<i>Both Cash and cashless</i>
<i>Popcorn</i>	<i>Food Item</i>		<i>Coin operated</i>
<i>Pretzel</i>	<i>Food Item</i>		<i>Coin operated</i>
<i>Fruit</i>	<i>Food Item</i>		<i>Coin operated</i>
<i>Candy or gum ball</i>	<i>Food Item</i>		<i>Coin operated</i>
<i>Bread</i>	<i>Food Item</i>		<i>Coin operated</i>
<i>Instant noodles</i>	<i>Food Item</i>		<i>Both Cash and cashless</i>
<i>Hamburger</i>	<i>Food Item</i>		<i>Both Cash and cashless</i>
<i>Snack and beverages</i>	<i>Food Item</i>		<i>Both Cash and cashless</i>

<i>Frozen Food</i>	<i>Food Item</i>		<i>Both Cash and cashless</i>
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1999 and after which the snacks vending machine industry was on the rise. In the Year 1999, more than 857,000 coin operated vending machines were produced and shipped. Due to the less amount of raw material required to make a vending machine which are very cheap and are easily available, therefore making it less complicated and not requiring any extra effort. One of the factors because of which we can witness in the production of vending machines is that it is cost effective and the process of making it can be easily comprehended. They're also a massive time saver. No more wasting time preparing beverages as they're dispensed in less than 20 seconds. Also investing in a vending machine for the workplace can contribute in boosting productivity, morale and focus. In fact, around the globe, the vending machine has only continued to gain more valuable momentum as further interest and investment have continued to propel for the advancement and enhancement of this invention.

Being immersed in technology has become a part of our culture and more and more people are seeming to be joining hands to transform the world in a techno savvy world. Things around us, are continuing to get smarter, faster, more connected and increasing digital. When every little object which we have used in the past have been up ameliorated so then how much of upgradation an electronic operated device called vending machine

Discussion and Conclusion

Vending machines have come a long way since their humble beginnings. Technological advances have made it so these machines are both easily accessible and convenient to use. Of course, a lot of this is really thanks to the fact that the vending machine has continued to prove its value time and again over the years. Also the advancement in the vending machine has made it far more effective and successful than it has ever been. In turn, this has empowered forward quite a lot of interest and investment in the ongoing evolution of the vending machine from this point onwards.

From humble single cent beginnings, vending machine have evolved into a 36.6 billion industry only in United States. Back then Canned cold drinks where the industries top sellers in the year

have undergone and still can undergo is a questions which will require ages to be solved

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