

## **Automatic Stack Feeding Machine**

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**Abstract:** Automation is one of the basic tool for improving the productivity. Automation in packaging of different types of pouches, papers etc. inevitable and its demand increasing steadily in packaging industry. Automatic Stack feeder machine" which is based on the mechatronics principle and it include hopper, feed roller and conveyor. The feeder machine in automation industry used for dispense different types of items at high rate, reduces the time, increases the production rate and reduces the human effort.

**Keywords** – Productivity, Automation, Stack, Dispense, Packaging.

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### **I. Introduction**

Automation will no longer be seen only as automatic production, but as a complex of technologies that guarantee reliability, flexibility, safety, for humans as well as for the environment. Automation is defined as a technology concerns with the application of mechanical, electronics and computer-based system to operate and control the production. The automation in mechanical systems leads to increase in productivity. A feeder machine is a machine that dispenses items such as papers, pouches and as per our requirements different types of products of packaging, which reduces the time and also reduce the human effort required to during the packaging time. The Automatic Teller Machine (ATM) is the best example of all, for the application of engineering principles to reduce time and human effort.

### **II. Problem Identified**

In most of industries, it has been seen that the feeding of raw material is done manually. Now- a-days some industries also use automation in feeding; still it has limitation that they are not fully automated. Some worker participation is always required. Thus, we used the mechanism that feed the different types of pouches at speed of 100 pouches in 1 minute at equal space without any damage to pouch. The pouch lies on conveyer belt should be in such position that scanner machine should be able to read barcode provided on pouches.

### **III. Objectives**

The objective is to study and design the various mechanisms used for automating the mechanical system by categorizing it as per the conversion of motions from one form to other and to compile them in the form of database; which will help the user for easy access of mechanisms according to their requirements for designing the automated mechanical system using combination of mechanisms.<sup>[1]</sup>

### **IV. Methodology**

Basic idea begins with searching the various papers presented by different authors on automation which informs about the need of automation and also suggest various measures to be undertaken to increase productivity and also automation techniques.<sup>[1]</sup>

1. To collect and study various research paper that emphasizes on the need of mechanisms for different automation techniques.
2. To study different types of mechanisms and to understand its application and utility for automating the mechanical system.
3. To categorize the studied mechanisms as per the type of motion from one form to another for easy access of the user.
4. Compilation of mechanisms in the form of database has been which is nothing but the software which will help the user to get the required mechanism in less time and without much effort.<sup>[1]</sup>

## V. Literature Review

US Patent 3613497 Henry Verbeke Study and experiment a vending machine adapted to vend commode ties that are packed in bags or pouches. The pouches are loaded in a spaced vertical alignment on a plate of a column of the machine. The bags are supported by retainers at their tops. A pivotally mounted pawl is provided for each spring clip, and all of the pawls are supported on a pawl bar, with one pawl bar for each plate.<sup>[3]</sup>

The pulling of a plunger permits the lowermost pawl to engage a retainer on a column, and disengage the retainer from its associated pouch. Each time the plunger is pulled, the next lowermost retainer will be disengaged from its associated pouch. When all of the bags in the column have been vended, the column will automatically be locked out against further vending. The vending machine contains a plus reality of columns, with a separate plunger for each column.<sup>[3]</sup>

John M. Browne also invented vertical vacuum corrugation feeder and in US Patent 4688782 says A vertical vacuum corrugation feeder for separating and feeding sheets from either of two stacks includes single feed mechanism positioned between the stacks having integral dual feed heads surrounded by at least one feed belt, the dual feed heads include vacuum plenums for pulling the sheets against the feed belt for forwarding away from the Stacks.<sup>[4]</sup>

Fatehali Dharssi research on packaging and in his US Patent 6993887B3 the invention comprises a packet placing system for use with an automated packaging machine. Preferably, the system is used to include packets with products being automatically packaged, such as various bread products.<sup>[6]</sup>

The system may comprise various magazine orientations and arrangements for holding packets, a packet placer, and a gluing system. Preferably, the packet placer includes a vacuum system configured to pick a packet from the mega Zine. Glue is applied to a face of the packet, which is then placed on the outside of the Wrapper of the packaged product. The system may be used in conjunction with a packet insertion mechanism in order to both insert a packet inside the Wrapper and removable affix a packet to the outside of the Wrapper. The invention also comprises methods of using the system.<sup>[6]</sup>

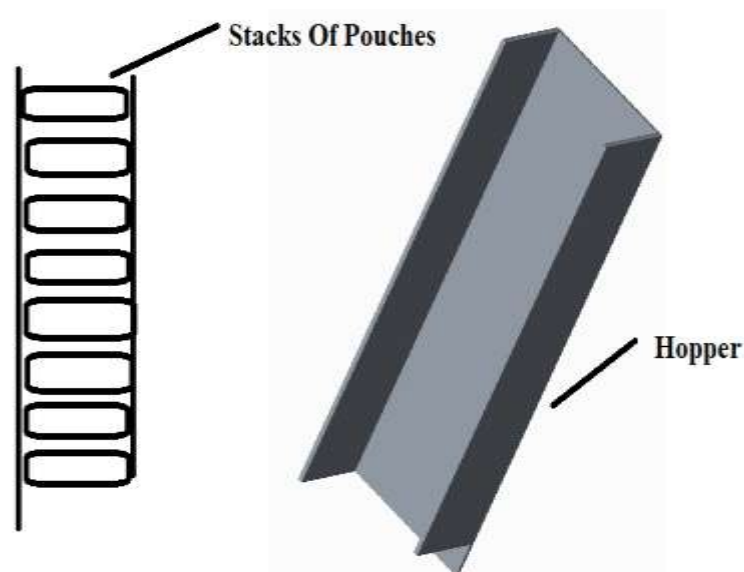
## VI. Methodology

The Automatic Paper Vending Machine works under the methodology of the mechatronics system with the objective to provide automation. It consists three main components:

1. Hopper
2. Feed Roller
3. Conveyor Belt

### Hopper:

Hopper is rectangular shape component with specific angle at the base will contain the stack of pouches vertically and roller mechanism also provide at base. It will also have an adjusting mechanism at back side of hopper to maintain size of hopper as per requirement of different pouches.

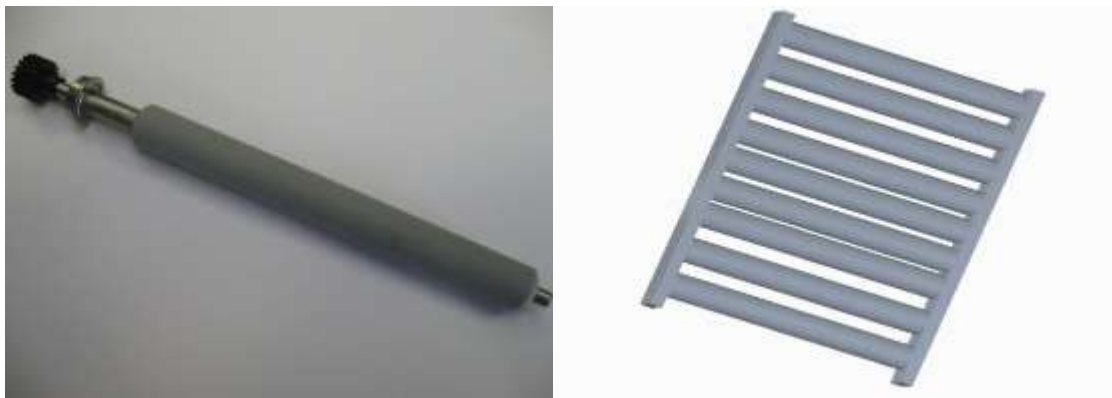


**Fig.1 Hopper****Specification:**

Name	:	Hopper
Length	:	30 cm
Width	:	20 cm
Height	:	60 cm
Capacity	:	20 Pouches
Material	:	galvanized steel sheet

**Feed Roller:**

Roller mechanism uses will be get drive either by electrical motor or due to gravity. The roller mechanism will contain number of roller on which pouches will be slide and will move forward on conveyor belt. The length and width of roller will same as the hopper. The roller mechanism will occupy the same space as that of pouch width. It will be fitted on sloping plate at base of hopper, by using this mechanism we able to avoid any collision between two pouches.

**Fig.2 Roller****Conveyor Belt:**

Conveyor belts are used in a wide variety of material transport applications such as manufacturing, food processing, and heavy industry. Many industries use Belt conveyor systems to transport raw materials and products through the stages of a process or to and from storage.

**Fig.3 Conveyor Belt**

Slide Bed Belt Conveyors, which finds application in automated distribution and material handling in warehousing. It consists of two or more pulleys fitted with continuous loop called conveyor belt. One pulley which is called drive is rotated using motor to slide the conveyor belt, which carries the product on its surface.

We use only highest quality material for making this product in order to reduce belt stretch. Here the conveyor belt we have use will carry no of pouches to packaging machine with suitable alignment mechanism. The conveyer speed in the form of motor will get vary as per requirement by using VFD (variable frequency drive panel).

**Specifications:**

Conveyor Type	:	Slide Bed Belt Conveyors
Belt Width	:	4" to 48"
Belt	:	Black P.V.C.
Drive	:	1/2 H.P. 230/460/3/60
Bearings	:	Grease Sealed
Frame	:	4" Deep Formed 12 Gauge
Pulleys	:	4" Dia. Crown Face Rubber Lagged Drive
Supports	:	"H" Type Adjustable

**VFD Control Panel:**

The VFD Panel (Variable Frequency drive panel) also known as VFD Control Panel are designed to control the speed of electric motor and feed pump. They are widely used in drilling, pumping, conveyor belt and other large machine application.



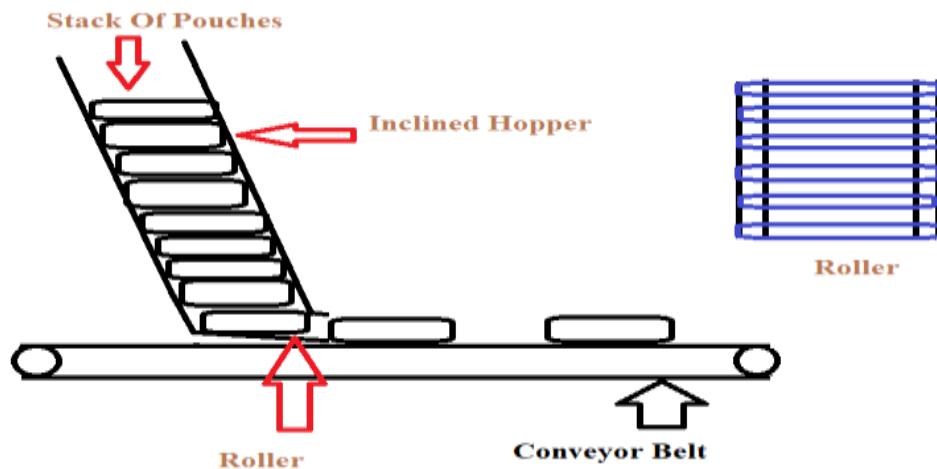
**Fig.4 VFD Control Panel**

**VII. Mechanism and Working Principle**

Vertical stack feeder is an automatic feeder machine widely used in automation industry and material handling industry usually use to feed the material like pouches, card, pockets etc. on the conveyor belt for packaging purpose. The automatic vertical stack feeder mainly consists of three main parts as we mentioned above like Hopper, conveyor belt, and roller mechanism. The hopper is situated above the conveyor belt and the roller mechanism is also provided at base of hopper.

The automatic vertical stack feeder work as when the pouches is fill in hopper one after another at limited level and as we start conveyor belt drive and roller mechanism. The bottom most pouch come out of hopper first and reaming pouches come one after another. According to our requirement we have to dispense the

100 pouches in one min. Therefore, arrangement of the speed of conveyor and also roller is according to dispense the 100 pouches in one min. One most important factor is the distance between the two pouches should be same. It can be also achieved by varying the speed of the conveyor belt and Roller. We can vary the speed of conveyor belt by using VFD panel to full fill the requirement as we require.



**Fig.5 Mechanisms of Hopper, Roller and Conveyor Belt**

In this mechanism involves hopper (in hopper stack of pouches), the roller mechanism (which handle the pouches pressure and dispense the pouches from the hopper to conveyor belt) and conveyor belt (contain pouches dispense from the hopper and distance between two pouches is same the mechanism as shown in fig (b) is modified mechanism of AFD (Automatic Stack Feeder). As we mentioned earlier in test 1 while taking test on mechanism we face some problem. we worked on that problem and makes some modification in that mechanism as we tilt vertical hopper with some angle the advantage of tilting hopper is that the pressure which was taken by bottom most pouch is reduces to some level, that pressure is now taken by the support of hopper. We are also going to introduce roller mechanism at the bottom of hopper as it will also provide some motion to the pouch to come out of the hopper. As we seen in earlier mechanism hopper front support was straight rectangular due to which pouch was get stuck there so we provide corner to front support plate.

### VIII. Conclusions

Automatic Stack feeder machines are available to dispense various pouches, the feeding machine dispense the pouches on the conveyor belt at high speed and specific distance, which is a much-needed automation packaging industry. Pouches finds applications almost everywhere in packaging industry and this type of automatic stack feeding machines could be used to reduce time and human effort with improved performance of the packaging and also one of the most important factor is cost, the cost of automatic stack feeder is very low.

### References

- [1] Rahul R. Gurpude, Study of mechanism used for automating the mechanical system, International Journal of Engineering Trends and Technology (IJETT) – Volume 26 Number 2- August 2015, ISSN: 2231-5381.
- [2] A.O. Hannure, Literature Review on Automatic Seed Feeder, International Journal of Engineering Trends and Technology (IJETT) – Volume 36 Number 7- June 2016
- [3] Henry Verheke, Pouch vending machine, United States Patent 3,613,947, Nov 19 ,1971
- [4] John M. Browne, Vertical vacuum corrugation feeder, United States Patent 5,249,787, Aug. 25, 1987.
- [5] Edward M. Iftovits, Modular document feeder device, United States Patent 4,688,782, Oct. 5, 1993.
- [6] Fatehali Dharssi, System and method for including packets with goods during automated packaging, United States Patent US 6,993,887 B2, Feb. 7, 2006.
- [7] Kamalanathan.P Automatic paper vending machine, International Journal of Science, Engineering and Technology Research (IJSETR), Volume 4, Issue 4, April 2015.