AUTOMATED MECHANICAL SYSTEM TO LOAD THE PACKAGING CARTON IN PRODUCTION LINE.

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Abstract

After advancement in early 20th century Packaging plays a valuable role in our global economy and touches the lives of everyone. Product packaging and handling might seem simple but it is one of the challenging tasks today in global economy. Industry has an interest in keeping packaging to a minimum, to reduce costs as well as to comply with packaging law. In this competitive market where products get shipped across nations, proper handling and packing keeps business profitable.

Packaging also refers to the process of design, evaluation, and production of packages. In order to have efficient and profitable business, automation is of utmost importance. Engineering packing for semi-flexible or rigid products and automating transition for manufacturing is the key focus of this paper. That includes reconstructing boxes from flat cartons, verifying their shape and structure along with overall intactness of top and bottom seals is principally addressed in this paper. This paper demonstrates development of a workstation assisting packaging from scratch all the way to labeling.

This simple and reliable automated mechanical system to load packaging carton can be important advancement for Packaging Industries. Low initial setup cost with moderate speed & maintenance can attract industries attention.
Introduction

Improving efficiency and reducing costs are driving forces in packaging industry. We know that Packaging plays critical role in automation. There are certain questions that must be answered before to form production line which are as follows, 1) How to handle flat carton to the production line? 2) How to open the flat carton? 3) How to close and seal the top and bottom flap? 4) How to label the sealed carton? And 5) How to off load the carton from production line? Here, rectangular flat cartons for semi-flexible or rigid product like toys are chosen to build the Demo case. Different work stations are shown according to the function and concept. Low initial setup cost and simplicity of the design was kept in mind.

Station-1 (open the flat carton)

Fig.1 shows the Layout of station-1 while Fig.2 shows the simple mechanism used to open a flat carton. The reciprocating movement of Magnetic cylinder moves the lever arm.

Magnetic Cylinder with In Built Switch

Lead Arm
Suction cups at the ends creates vacuum when cylinder reaches its BDC and pull a flat carton from stacks. During the motion, one end of the carton is opposed by lead arm that opens the carton from other side. We can have Magnetic cylinder according to required stroke length.

**Station-2 (Flip the vertical Flaps and Load Finished Product from Other side)**

Fig.3 shows the layout of Station-2, when opened carton comes to station-2 conveyer stops for a while and finished product is filled using ram as shown. One side of vertical flap is closed using one arm and actuator while other one can be close automatically using one guide bar. End situation is shown in Fig.4 for station-2.
Fig-3

Fig.4

Ram

Closed flaps

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Station-3 (Flip the other vertical flaps)

Fig.6 shows end condition of box flaps. Similar to station 2, same arrangement can be made like using combination of actuator, lever arm and guiding bar. So at this station, we have all vertical flaps closed.
These kinds of use of motion guiders are very common now. Not only, It reduces the initial cost but makes it easy to maintain and longer the life of production line.

**Station-4 (Apply Adhesive on Both Vertical Flaps)**

Fig.7 shows working concept at station-4, where Hot Melt Adhesive gun applies glue to vertical flaps during its motion. Only one gun is shown for easy. It senses the surface and applies the glue in a straight pattern at the corners. More than one gun can be arranged.

**Station-5 (Flip all Horizontal Flaps)**

Fig.8 shows end condition at station-5, where two guide ways along the conveyer flips the both side’s flaps and also, insures that flaps are well closed.
In conclusion, we can say that using simple design and motion guiders we can reduce the initial setup cost of the production line at the same time we can make it more reliable. Simple design and yet real layout of work-station ensures the safe operation of packaging. This project provides an opportunity to learn about use of suction cup, magnetic cylinders, etc. on production line. It will be very helpful for all packaging industry to develop packaging machine using such simple mechanism and keep packaging to minimum.
Bibliography:


