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Fabrication of Material Conveying System

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ABSTRACT

To increase the productivity and to overcome skilled labour shortage, most of the manufacturing industries are going for automation. The main aim for us to select the project work is to acquire practical knowledge in the field of automation using sensing interlock system. We selected " MATERIAL CONVEYING SYSTEM " as our project work and we used principles of circular motion into linear rotary motion in developing this project work, the material handling mechanism is achieved by motoring action which is controlled by sensing element with interlock operated by ON/OFF control relay. Here the circular motion of the shaft rod is converted to linear rotary motion of the belt conveyor. It has become increasingly difficult to hire personnel who are adequately trained and willing to undertake the tedious task of inspection. Therefore the efforts are made to design and implementation of automatic technique to determine the completed unit of object using microcontroller.

Keywords: Material Conveying System, Control Relya, Microcontroller, Interlock.

I. INTRODUCTION

In our engineering education the project work plays a major role. Every student is put in to simulated life particularly where the student required bringing his knowledge, skill and experience of the project work. It helps how to evolve specifications under given constrains by systematic approach to the problem a construct a work device. Project work thus integrates various skills and knowledge attainment during study and gives orientation towards application.

Automation is the use of control system for handling different processes and machineries to replace human efforts. Nowadays, more and more companies are switching to automation. The implementation of advanced automatic control system on the basis of industrial controllers enable us to programmatically perform a main handling system effectively. This paper will focus on the implementation of requirements to control the belt conveyor. The use of automatic control on all parts of the machine system; which will play a major role in controlling all the

parts of the system. Our research is about to fabricate an automated packaging machine system. Electrical DC motors control were used as actuators for the entire process to move the upper & lower conveyor belts and the sensor used to feed the conveyor system by system information. Conveyor belt used for transporting samples from one location to another, which would be packaged into a specific paper boxes later. Automated system reduces the labor cost and the production time with reduction of product packaging rate.

As the students solve the various problems exposed by the project work, the students get the confidence to overcome such problems in the future life. It helps in expanding the thinking and alternatives for future applications. Automated conveyor systems with programmable logic controls (PLC) offer several benefits including:

- Reduced labor costs
- Reduced errors
- Reduced downtime
- Better use of storage space
- Eliminate process bottlenecks
- Variable production rates
- Sustainable production efficiency
- Access to real-time conveyor information

II. EXISTING SYSTEM

Conveyors are especially useful in applications involving the transport of heavy or bulky materials. Conveyor systems allow quick and efficient transport for a wide variety of materials, which make them very popular in the material handling and packaging industries. They also have popular consumer applications, as they are often found in supermarkets and airports, constituting the final leg of item/ bag delivery to customers. Many kinds of conveying systems are available and are used according to the various needs of different industries.

Conveyors are able to safely transport materials from one level to another, which when done by human labor would be strenuous and expensive. They can be installed almost anywhere, and are much safer than using a forklift or other machine to move materials. They can move loads of all shapes, sizes and weights. Also, many have advanced safety features that help prevent accidents. There are a variety of options available for running conveying systems, including the hydraulic, mechanical and fully automated systems, which are equipped to fit individual needs.

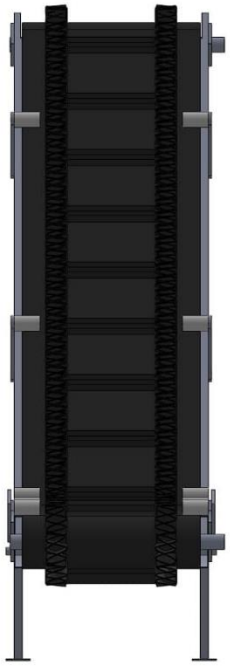

Figure 1. Existing Conveyor Belt

Belt conveyors are the most common and simplest form of conveyor and can have variable speeds. They have a moving belt that rests on a steel frame that supports the belt and the materials being moved. Ones that have a supporting frame underneath are referred to as sliding style. When the belt is supported by closely placed rollers, it is called a roller belt style.

Drawbacks

- High power consumption consumed by without automatism conveyor.
- High man power.
- Sorting delay will take place.

III. PROPOSED SYSTEM

A conveyor system is a method for moving packages, products, supplies, parts, and equipment for production, shipping, or relocation. The different types of conveying systems include pneumatic, screw, belt, and roller. The construction of individual systems depends on the materials to be moved, which includes their weight, dimensions, and ability to be transported.

In many packaging industries, object sorting is the major task that needs to be done at final dispatch section. Sorting of various products in such industries is accomplished based on numbers. Manual sorting is the tradition approach that preferred by industries that involves visual inspection performed by human operators. This traditional approach is tedious, time-consuming, slow and non-consistent.

It has become increasingly difficult to hire personnel who are adequately trained and willing to undertake the tedious task of inspection. Therefore the efforts are made to design and implementation of automatic technique to determine the completed unit of object using microcontroller. In implemented system, object sensor is used to find the job placed on conveyor belt to rotate automatically.

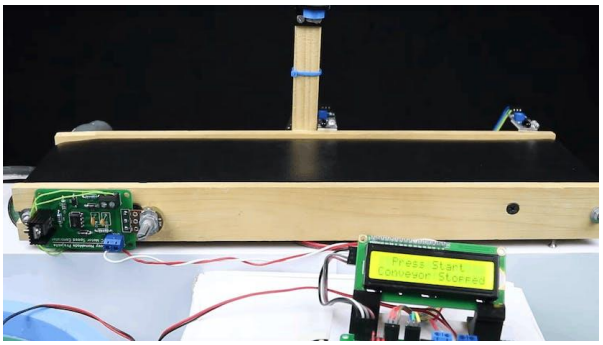

Figure 2. Proposed Conveyor Belt

Advantages

- Easy & fast transportation of materials from one location to another.
- Reduce labor costs and improves productivity.
- Prevent human injury and product damage while transportation.
- The multi-floor material movement made easy.
- Very helpful in truck loading and unloading.

IV. CONSTRUCTION MODEL

The project consist of

1. Belt
2. Dc drive
3. Controller (arduino)
4. Sensors (a). Object
   (b). day light saver
5. Lighting system
6. Pulley

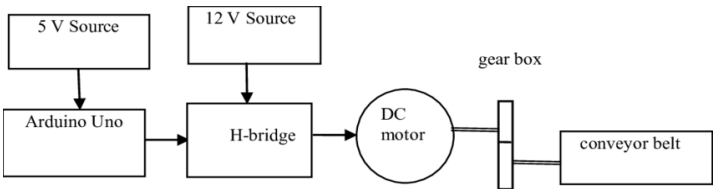

Figure 3. Block Diagram of Automation Conveyor System

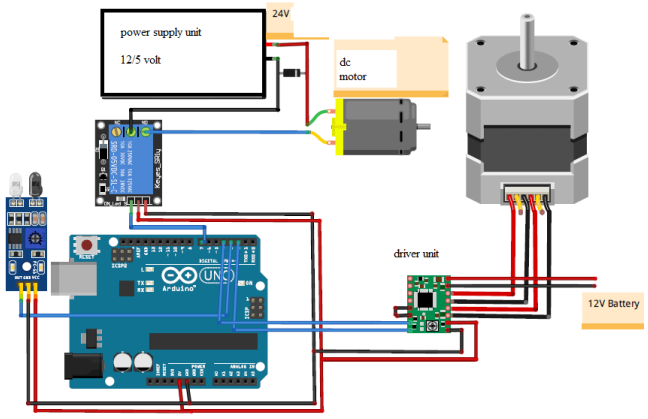

Figure 4. Configuration of the Proposed Model

4.1 Arduino uno

Arduino Uno is an open-source microcontroller board based on the processor ATmega328P. There are 14 digital I/O pins, 6 analog inputs, a USB connection, a power jack, an ICSP header, and a reset button. It

contains all the necessary modules needed to support the microcontroller. Just plug it into a computer with a USB cable or power it with an adapter to get started. You can experiment with your Arduino without worrying too much about it. In the event of a worst-case scenario, you could buy a new one as the Uno is very economical compared to other boards like raspberry pi, STM, etc.

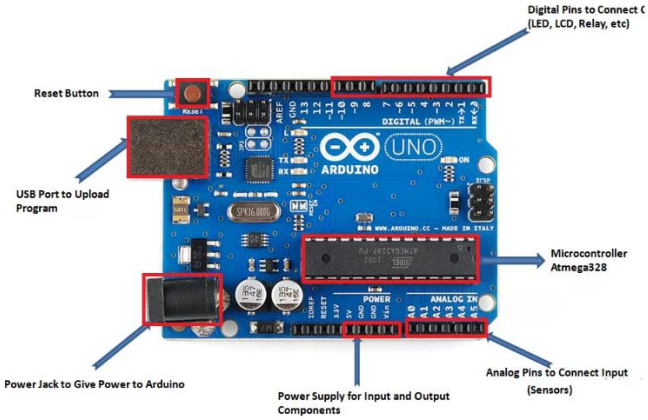

Figure 5. Arduino uno

Microcontroller: Microcontroller is the central processing unit of Arduino Uno.

Digital Pins: There are 14 digital pins on Arduino Uno which can be connected to components like LED, LCD, etc.

Analog Pins: There are 6 analog pins on the Uno. These pins are generally used to connect sensors because all the sensors generally have analog values. Most of the input components are connected here.

Power Supply: The power supply pins are IOREF, GND, 3.3V, 5V, Vin are used to connecting sensors because all the sensors generally have analog values. Most of the input components are connected here.

Power Jack: Uno board can be powered both by external supply and via USB cable.

USB Port: This port function is to program the board or to upload the program. The program can be uploaded to the board with the help of Arduino IDE and USB cable.

Reset Button: This is used to restart the uploaded program.

Infrared technology addresses a wide variety of wireless applications. The main areas are sensing and remote controls. In the electromagnetic spectrum, the infrared portion is divided into three regions: near infrared region, mid infrared region and far infrared region.

The wavelengths of these regions and their applications are shown below.

1.Near infrared region — 700 nm to 1400 nm — IR sensors, fiber optic

2.Mid infrared region — 1400 nm to 3000 nm — Heat sensing

3.Far infrared region — 3000 nm to 1 mm — Thermal imaging

DC Motor Drives

The DC motor drive is a type of amplifier or power modulator that integrate between the controller and a DC motor. It takes the low current and then converts it into a high current which is appropriate for the motor. The DC motor drive also provides the high current torque, 400 % more than the rated continuous torque. The important applications of DC motor drives are rolling mills, paper mills, mine winders, hoists, machine tools, traction, printing presses, textile mills, excavators and crane.

L298N Driver

The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A.

4.2 Mechanical Assembly Diagram

Conveyor systems consist of a belt stretched across two or more pulleys. The belt forms a closed loop around the pulleys so it can continually rotate. One pulley, known as the drive pulley, drives or tows the belt, moving items from one location to another. Design of conveyor system need to consider the following specifications:

1. Throughput.
2. Maximum load capacity.

3. Conveying Speed.
4. Trough Size.
5. Trough Material.
6. Conveyed material size & bulk density.
7. Drive location.

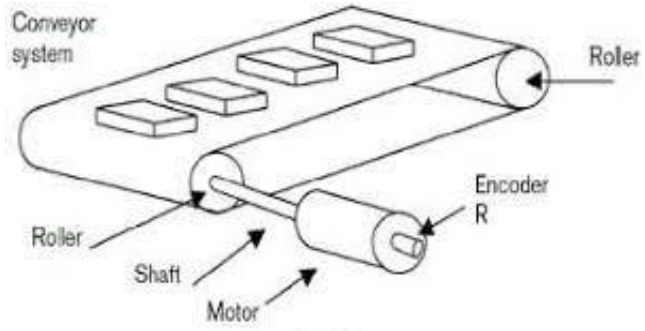

Figure 6. Belt Conveyor System

A belt conveyor is a system designed to transport or move physical items like materials, goods, even people from one point to another. Unlike other conveying means that employ chains, spirals, hydraulics, etc., belt conveyors will move the items using a belt. It involves a loop of a flexible material stretched between rollers that are actuated by an electrical motor.

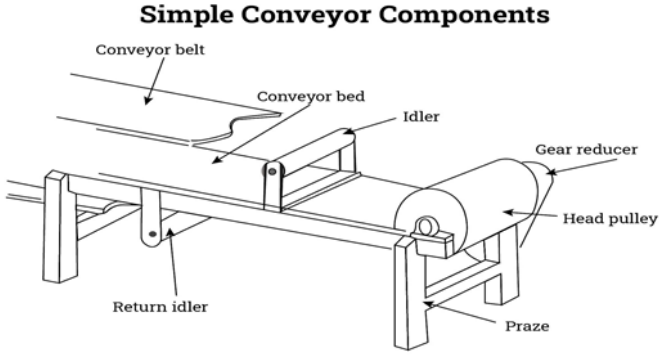

Figure 7. Components of a Belt Conveyor

A standard belt conveyor system has a head pulley, tail pulley, idler rollers, belt, and frame.

V. CONCLUSION

We make this project entirely different from other projects. Since concepts involved in our project is entirely different that a single unit is used to various purposes which is not developed by any of other team members. By doing this project we gained the knowledge of industrial conveyor system is how automation can be effectively done with the help of electric and electronic system. It is concluded that any automation system can be done with the help of machine system. By doing this project work, we understood the working principle and uses of various belt systems.

VI. REFERENCES

[1]. Imran S.Khan , Prof. Ravindra Gandhe, STUDY AND ANALYSIS OF ROLLER CONVEYOR IN MATERIAL HANDLING, Khan,4(8): August, 2015] ISSN: 2277-9655 (I2OR), Publication Impact Factor: 3.785

[2]. Harshavardhan A. Kadam , Nilesh S. Hyalij ,Design and Analysis of Belt Conveyor Roller Shaft, International Journal of Engineering Trends and Technology (IJETT) – Volume 36 Number 1- June 2016

[3]. Konakalla Naga Sri Ananth , Vaitla Rakesh , Pothamsetty Kasi Visweswarao, DESIGN AND SELECTING THE PROPER CONVEYOR-BELT, Ananth et al., International Journal of Advanced Engineering Technology E-ISSN 0976- 3945

[4]. Alhade A. Algitta, Mustafa S., Ibrahim F., Abdalruof N. and Yousef M Automated Packaging Machine Using PLC, IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 2 Issue 5, May 2015. www.ijiset.com ISSN 2348 – 7968

[5]. Abhijit Gaikwad , Yogesh Raut , Jitendra Desale , Akshay Palhe, Govinda Shelar, Prof.Shreekant Pawar, Design and Development of Automated Conveyor System for Material Handling, IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, PP 31-34

[6]. Ghazi Abu Taher, Yousuf Howlader, Md. Asheke Rabbi, Fahim Ahmed Touqir, Automation of Material Handling with Bucket Elevator and Belt Conveyor, International Journal of Scientific and Research Publications, Volume 4, Issue 3, March 2014 1 ISSN 2250-3153

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