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MICROCONTROLLER BASED MATERIAL SORTING SYSTEM

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Abstract-
The future of all the mechanical industries lays in automating the manual processes so as to reduce the human effort and at the same time increase the productivity and accuracy levels that cannot be achieved with manual operations. Our Proposed work aims at testing of the manufactured component by an automated way instead of using the manual means for inspecting the material moving on the conveyor belt of different sizes and can be separated automatically with each other.

Introduction-
The main objective of this proposed work is to build a unique kind of algorithm to achieve a new kind of approachability in the field of automation in industry. The height based material sorting system with conveyor mechanism is one of those types of different view for automation in machines. These machines are designed to work at different places without the involvement of the man.
A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the transportation of heavy or bulky materials. Conveyor systems allow quick and efficient transportation for a wide variety of materials, which make them very popular in the material handling and packaging industries. Many kinds of conveying systems are available, and are used according to the various needs of different industries.
We here are making a conveyor belt based machine that carries goods of different height. The object rejection set up removes the item from the moving belt if it does not fulfill the condition.
This machine causes objects or articles to travel along a path wherein the objects are scanned by known types of Infrared electronic sensors which determine the height of material. Downstream of the scanning location there are means actuated by the sensor to eject or divert material from its normal path of travel to a collection station for similar heights of objects. The block diagram of proposed work is shown in the figure 1:

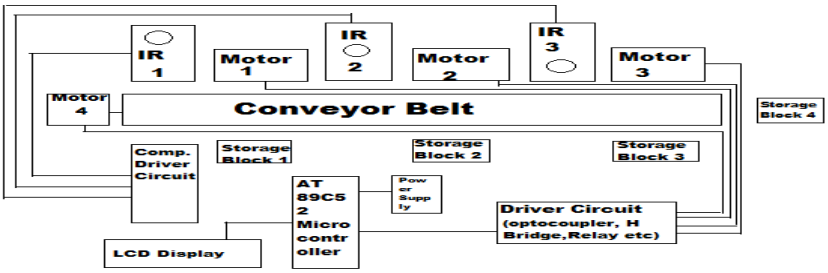

Figure 1

PROPOSED WORK DESCRIPTION

The objective of the proposed work is to design, fabricate and develop a fully automated end of line testing machine. With this objective the proposed work is divided in 3 modules as:

- Concept Designing
- Fabrication and Assembly
- Automation

CONCEPT DESIGNING

This phase involves the design of the various elements of the mechanical structure. This includes the design of the conveyor belt along with the conveyor rollers, supporting wooden plate for mounting the motor, worktable on which the entire assembly is mounted. The design has been developed from the point of view of manufacturing feasibility, reliable detection, reducing the rejection rate etc.

The design consists of the following components/elements:

- Microcontroller.
- Conveyor Belt of 1300mm length, 63mm width.
- DC Gear motor for providing the required rotation motion to the belt having torque capacity depending upon the load to be moved/ rotated.
- Supporting plates for the motor and the roller of suitable dimensions.
- The conveyor roller of appropriate length, 50mm diameter and the amount of friction to prevent slipping of the belt on it such that it we have a smooth rotation motion of the conveyor.
- Supporting wooden base for rigidly holding the whole assembly**.**

The Assembly Drawing is shown in the figure 2:

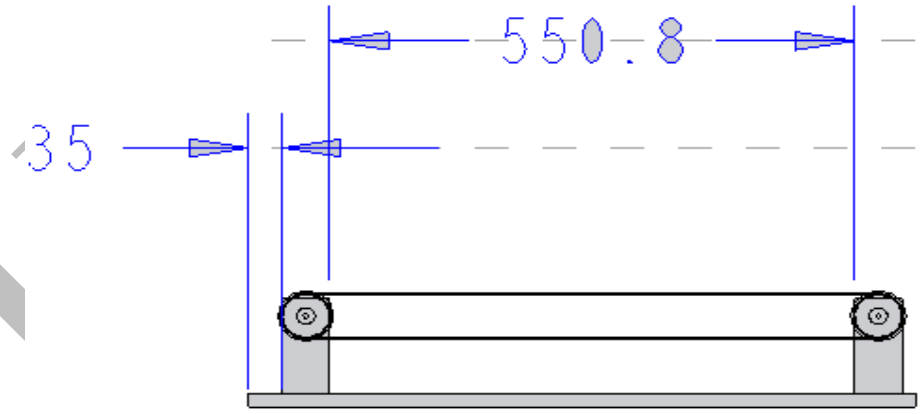

Figure 2

FABRICATION AND ASSEMBLY

This phase deals with the fabrication and assembly of the individual components. The Conveyor, Conveyor Roller, DC Gear Motor, the supporting plates for the motor and rollers, sensor station and PCB are to be assembled together and properly mounted on the wooden base for the worktable with perfect alignment. Various manufacturing processes like lathe turning operation, wood working & drilling operations have been performed to fabricate

AUTOMATION

Start/Stop control of the DC motor for running the belt step upon detection of components being tested by sensors is achieved through instructions being fed through the microcontroller. The motor is to be interfaced with this controller, so that it can be directed and controlled by the program. DC Motor is controlled by the H bridge circuit with two optocoupler circuit. H Bridge is a combination of four transistor circuit. Out of these four transistors two transistors are NPN and two transistors are PNP transistor. With the help of these four transistors we control the movement of the motor.
Figure 3, below shows the DC motor drive logic.

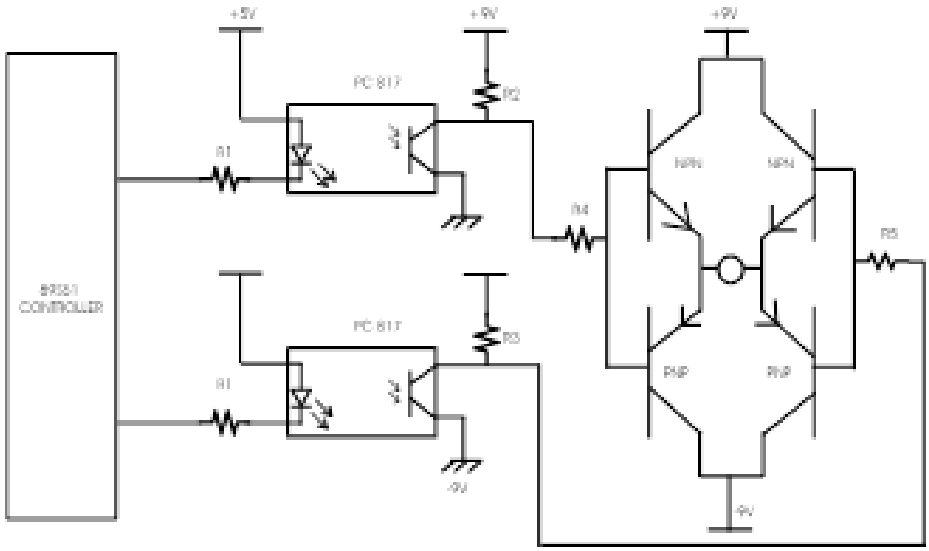

Figure 3

PROPOSED WORK APPLICATIONS

May be used in many industries, including the automotive, agricultural, computer, electronic, food processing, aerospace, pharmaceutical, chemical, bottling, print finishing and packaging. Although a wide variety of materials can be conveyed, some of the most common include food items such as cold drink bottles and cans, automotive components, scrap metal, wood and furniture.

CONCLUSION

The concept of developing a Material sorting system has been executed. We have developed an automated machine, which would be the precursor for the future developments.
The conclusion of the proposed work is as follows:

1. In the past, there were no such materials handling system which can sort the object on the basis of their heights.
2. We have achieved a result in which the material can be sorted based on their different heights.
3. The count of the material will be shown in LCD.

FUTURE SCOPE

The Material sorting machine designed and fabricated by us is an elementary system. There is tremendous scope of improving this system and incorporating additional features, which will further its scope and facilitate its incorporation into a real time automation machine, some of the improvements possible are:

- Introducing a robotic arm that will separate the different height of component and it will be put on another belt from where they can be collected.
- Ensuring FOOL-PROFING so that the operator can never make a mistake of mixing of different height of material.

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