ISSN: 2278 – 909X
International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 5, Issue 3, March 2016

"DESIGN & CONSTRUCTION OF RFID ASSISTED AUTOMATIC BAGGAGE SORTING SYSTEM"

Prof. S.B.Idhate , Akshay S. Gaikwad,Vinay Yeljale, Nikhil Deshmukh

[1]

***Abstract*- These This project report incorporates all the details of 'Design and Construction of RFID assisted object sorting system using AVR microcontroller especially for distribution of baggage at airport terminals. It also involves fundamentals of embedded C language and description of various components used in this automation system that were studied during seven and eight semester of Bachelor of Engineering course provided by University of Pune.**

In present project, an automated baggage sorting system that has been designed using AVR microcontroller so that it could be cheaply implemented on a small size airport terminal with a low cost. A prototype conveyor system is developed with the integration of Radio Frequency Identification (RFID) technology and sorting mechanism is used instead of a robot hand for baggage handling in a airport environment.

This is an automated system with RFID tags/detectors, intelligent control systems, sorting mechanisms and smart conveyor system. This study demonstrates the significance and benefits of a smart conveyor system with the integration of RFID technology for product identification and handling, specifically in Airport industry.

My main work focused on RFID technology which is used for the purpose of identifying products which lead to a better identification than existing barcode systems. Furthermore, large data could be embedded in to the tag and could be placed inside the product to avoid damages. Each baggage is tagged with a passive RFID transponder which enables identifying of the objects and sorting. As the RFID reader identifies the objects on the main conveyor, the inventory database is automatically updated.

The sorting movement of the mechanical pusher is assisted by a 6V geared DC motor coupled to DVD writer used as pushing mechanism.

***Index Terms*-About four key words or phrases in alphabetical order, separated by commas.**

***Manuscript received Mar, 2016*.**

***Prof. S.B. Idhate** Electronics & Telecommunication, Savitribai Phule pune University / imperial college of Engineering & Research / JSPM wagholi, pune, India, / 8237781345*

***Akshay S. Gaikwad**, Electronics & Telecommunication Savitribai Phule pune University / imperial college of Engineering & Research / JSPM /8087987878.*

***Vinay A. Yeljale**, Electronics & Telecommunication Savitribai Phule pune University / imperial college of Engineering & Research / JSPM /9527757533.*

***Nikhil Deshnukh**, Electronics & Telecommunication Savitribai Phule pune University / imperial college of Engineering & Research / JSPM /8149391615.*

I. INTRODUCTION

Baggage sorting is one of the major requirements for rapid processing in an airport. Airports at which hundreds of planes take off and land every day, around the clock, require an immense amount of planning and perfect coordination of complex processes for baggage sorting. Several thousand passengers move through the terminals every day and tons of cargo need to be handled.

The baggage handling system at an airport plays a crucial role in keeping travelers happy. It also can make the difference in an airport's ability to attract or keep a major airline hub.

A baggage-handling system has three main jobs:

- **Move bags from the check-in area to the departure gate.**
- **Move bags from one gate to another during transfers.**
- **Move bags from the arrival gate to the baggage-claim area.**

Baggage handling-

In the baggage handling system, belt conveyors transport the baggage items smoothly and reliably within the terminals. Airport baggage handling systems are often equipped with several kilometers of belt conveyors between the check-in counter and flight make-up or between the plane unloading point and the baggage reclaim area.

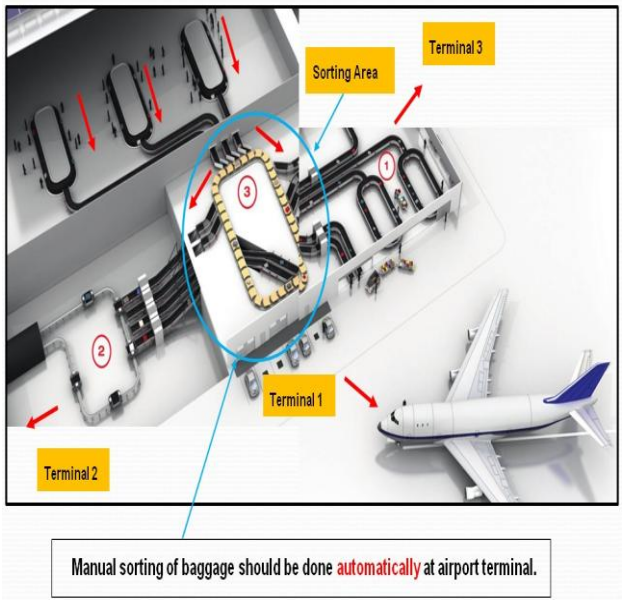
High-speed conveyors are of particular importance for spread-out transit airports. The baggage of transit passengers must be transported quickly and reliably from one terminal to another. But medium or small sized airports cannot take advantage of such systems because sorting is preformed at large space, handled by large size, high sped conveyor.

II. LITERATURE SURVEY

For larger airport automated system is must to match with the dynamic world. But there are over 100 small to

medium size airports handling between 1.5 and 6million passengers a year, still haven't automated or have done so to only a limited extent.. For many of these airports, there are still big gains to be made in cost, time and efficiency and sorting quality by introducing automated sorting system.

The problem for many of those airports is finding the right systems to do the job. Because in many cases, solutions are designed primarily for the larger airports where much of the automation market is to be found are not cost effective for lower volume environments, and often those system cannot be accommodated within the space constraints of smaller terminal buildings many of which have to handle today's constantly increasing passenger and baggage volumes in facilities that were originally built for much lower traffic levels.



PROBLEM DEFINITION: -

Solutions designed for larger airports are not cost-effective for lower volume environments and often can't be accommodated in smaller terminal buildings.

OBJECTIVE: -

Automatically Sorting of Baggage at Airport terminals to stated destination and logical control over a sorting system.

I am eager to find an easy and simple solution for those lower volume environments in this project work. In the present project, an automated baggage handling and sorting system has been designed using microcontroller so that it could be cheaply implemented on a small size terminal with a low cost. A small scale model of the project has also been constructed. The sorting system is based on RFID technology and tracking of baggage is done in a terminal.

Baggage coming from check in counter gets transported to airports terminals through distribution conveyors and sorted automatically with the help of microcontroller & distribution system.

Fig. 2.2 Objective of present project

III. BLOCK DIAGRAM

SYSTEM_DESIGN & WORKING: -

The first layer is a data capturing front-end system with IR sensors and RFID transponders and transducers. IR sensors are placed at the start and end points of the conveyors which are used for the detection of product presence on the conveyors and its positions.

Products are tagged with RFID transponders. Each tag consists of a unique identification number with 10digits. These identification numbers correspond to the product type. The products are identified using the RFID readers located in close proximity to the conveyors. According to the identified product type and details decisions are made to sort the products to the relevant sub conveyors. The RFID system identifies the product type and sends signals to the control system to guide the product to the relevant conveyor line using the pushing mechanism. IR sensors are used to identify the product locations along the conveyor belts.

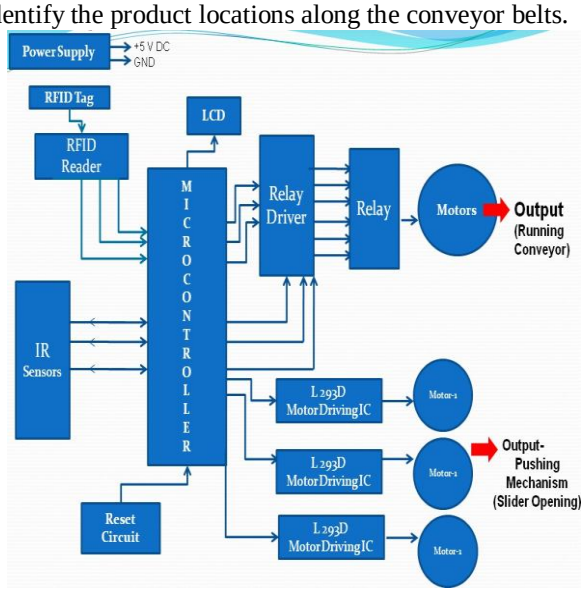


Fig. Block Diagram

Each baggage is tagged with a passive RFID transponder which enables identifying of the baggage. Each tag consists of a unique identification number. As the RFID reader identifies the baggage on the main conveyor, the database is automatically updated as signal send to microcontroller. On basis of input signal, Microcontroller decides baggage destination i.e sends signal to D.C motor of corresponding distribution conveyor. This process performs through Relay driver & Relays.

On basis of input signal from RFID Reader, Microcontroller decides baggage destination i.e sends signal to corresponding IR sensors. Then baggage on moving conveyor stops at corresponding gate due to IR sensors, this input again send to microcontroller and microcontroller send signal to L293D Motor driving IC to push that baggage to assigned distribution conveyor.

IV. POWER SUPPLY DESIGN

The circuit diagram of power supply which gives output of 5V, as only that much is required for microcontroller. Its circuit diagram and designing calculation are given below.

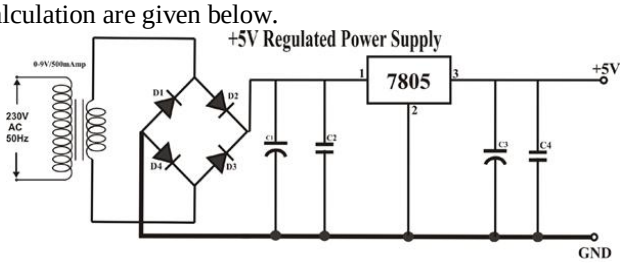


Fig. Regulated Power Supply

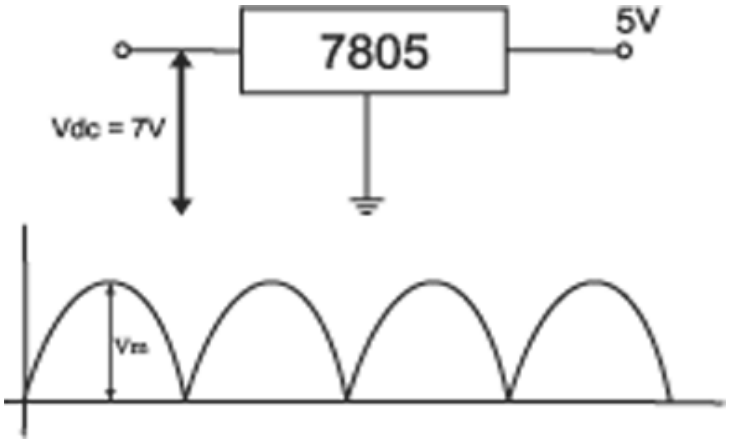
The +5 volt power supply is based on the commercial 7805 voltage regulator IC. This IC contains all the circuitry needed to accept any input voltage from 8 to 18 volts and produce a steady +5 volt output, accurate to within 5% (0.25 volt). It also contains current-limiting circuitry and thermal overload protection, so that the IC won't be damaged in case of excessive load current; it will reduce its output voltage instead.

The advantage of a bridge rectifier is you don't need a centre tap on the secondary of the transformer. A further but significant advantage is that the ripple frequency at the output is twice the line frequency (i.e. 50Hz) and makes filtering somewhat easier.

The use of capacitor c1, c2, c3 and c4 is to make signal ripple free. The two capacitor used before the regulator is to make ac signal ripple free and then later which we are using is for safety, if incase there is a ripple left after regulating, then c3 and c4 will remove it.

POWER SUPPLY COMPONENT DESIGN: -

Transformer Design:



We require 5V at the o/p of the regulator.

The drop out voltage of the regulator is 2V As per the data sheet)

Vdc = 5+2 = 7V

So at the regulator input, the voltage applied should be of 7V.

According to the formula,

Vdc = 2Vm/Pi

Assuming there is no ripple Capacitor from

Vm= Vdc .pi/2

=7 x 3.14)/2

=10.99V

Vm= 10.99V

During one cycle, two diodes are conducting.

Drop out voltage of one diode = 0.7V

Drop out voltage of two diode = 1.4V

Vim = Vm+ 1.4V

=10.99+1.4= 12.39V

Vim=12.39V

Vrms = Vim/sqrt (2)

= 12.39/sqrt (2)

= 8.76V

Vrms = 8.76V

So we select transformer of 9V.

Similarly

Im=Idc x pi/2

Im=400m x 3.14/2

= 628mA.

Irms= Im/sqrt (2)

= 628mA/sqrt (2)

` = 444.06mA

Irms = 444.06mA

So we select the transformer of current rating 500mA.

Considering the above transformer rating.

We take the transformer of 0-9V/500mA

TRANSFORMER - 0-9V/500mA Step-down transformer.

RECTIFIER DESIGN:-

PIV of diode = Vm = 12.39V

Im= 628mA

BRIDGE RECTIFIER -So, we select the bridge IC of 1Ampere rating.

V. RESULT & TESTING

Adopting Radio Frequency Identification technology for baggage sorting at airport terminals promotes flexible and efficient baggage conveying system. This enables a paperless working environment and real-time traceability of products within the airport which improves the operational efficiency and reliability.

After fabrication of project has been tested for different conditions. The system has been run for several hours in a normal environment. Three baggage of scale model with RFID tags have been put on the conveyer belt and monitor their movement through the system. The baggage are readily tracked through the RFID module and the mechanical pusher was successfully operated. There was no time lag in operating the pusher and baggage did not create any problem to divert the baggage to their destined terminal. There was a slight vibration in the conveyor belt and slipping of belt observed due to improper alignment of flat belt over driving roller but that error was resolved by tightening intermediate bolting system of conveyor. All the testing has been running successfully as expected.

VI. ADVANTAGES

In this report a smart product identification and sorting system is introduced with a prototype of conveyor system which adopts RFID technology for product identification and handling. The present design represents several key features, which can be noted.

1. Reduce time in baggage detection
2. Automatically handle the baggage
3. No chance of baggage missing
4. Eliminate the miss management in baggage sorting
5. Efficient identification system i.e RFID
6. Design by using low cost material with high strength.
7. Can be easily accomplished in bigger scale.

VII. CONCLUSION

In present project, an automated baggage sorting system that has been designed using AVR microcontroller so that it could be cheaply implemented on a small size airport terminal with a low cost. A prototype conveyor system is developed with the integration of Radio Frequency Identification (RFID) technology and sorting mechanism is used instead of a robot hand for baggage handling in a airport environment.

This is an automated system with RFID tags/detectors, intelligent control systems, sorting mechanisms and smart conveyor system. This study demonstrates the significance and benefits of a smart conveyor system with the integration of RFID technology for product identification and handling, specifically in Airport industry.

My main work is focused on RFID technology which is used for the purpose of identifying products which leads to a better identification than existing barcode systems. Furthermore, large data could be embedded in to the tag and could be placed inside the product to avoid damages. Each baggage is tagged with a passive RFID transponder which enables identifying of the objects and sorting. As the RFID reader identifies the objects on the main conveyor, the inventory database is automatically updated.

The sorting movement of the mechanical pusher is assisted by a 6V geared DC motor coupled to DVD writer used as pushing mechanism.

VIII. ACKNOWLEDGMENT

We have great pleasure in presenting a project report on "DESIGN & CONSTRUCTION OF RFID ASSISTED AUTOMATIC BAGGAGE SORTING SYSTEM"

We would also like to take this opportunity to express our honor and respect to **Dr. S. V. Admane, Principal**,Imperial College Of Engineering and Research, Wagholi, Pune 412207.

We are very greatful to **Prof. P. R. Badadapure** HOD of ICOER ,Wagholi for making available all the facility require for the successful completion of project.

Our sincere thanks to our guide **Prof. S.B. Idhate ,** for their suggestions in presentation of this report. We would also like to thank our teaching and non-teaching staff member for the guidance for our project.

Finally, we would like to thank all those who directly or indirectly made a contribution to complete this report.

IX. REFERENCES

[1] S. Press Tool-Design by C.Donaldson, George H LeCain & V. Goold (Tata McGraw-Hill edition), 'Design of Forming & Bending Dies', bending dies, bend pressure calculation, page no-731-741.

[2] A textbook of Production Engineering , P.C.SHARMA, Press tool Design ,strip layout, clearance, Blanking die design, die block, die block thickness, blanking die design, punch, stripper, shunt height of press, shut height of die, Page no-79-111.

[3] Die Design technique, T.R.Paquine, Cutting steels, adapting die to press, Page no-407-409.