Chicks Filling Machine

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Abstract

Chicks filling machine is a machine that designed to fill chicks in boxes, where each box contain a specific number of chicks. The project idea taken from a machine in Aziza Company, and our project is a small model for this machine. Where the model explains how this machine works, also it shows the parts and the work stages for the machine.

The chicks go through filling line, where the machine has four parts, the counter, the filling part, the sterilization part and the passing to worker.

The cost of this machine was one of the motivations to work in this project, Where and as the company's management told us that this machine cost the company a huge amount, and at the same time it can be ready with small amount of money in case the comparison with the previous amount.

Table of Contents

Table of Figures

Acknowledgment

The satisfaction that accompanies that the successful completion of any task would be incomplete without the mention of people whose ceaseless cooperation made it possible, whose constant guidance and encouragement crown all efforts with success.

We are grateful to our project guide Dr. **Ashraf Armoush** for the guidance, inspiration and constructive suggestions that helpful us in the preparation of this project.

We finally want to thank our colleagues who have helped in successful completion of the project.

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Introduction

Before start talking about the project, the project designed to be introduced for Aziza company, where the project idea taken and supported by the company. But by working on the project, there was a problem we were unable to find appropriate solutions for it despite numerous attempts. And the problem will be clarified in detail later.

Overview

The machine already exists in Aziza Company. Machine was imported from European country and cost the company a huge amount. Also the machine and don`t offer a lot of feature that can be used by the company management.

Purpose

The main objective of the design of this machine is to fill boxes of chicks in a specific number per box, as well as the sterilization of chicks, so that the worker just closes the box before the migration process of incubation.

This machine can be prepared in less cost than the old one, where and as we mentioned before the machine cost a huge amount of money. And this advantage can be done by using a simple but at the same time modern technology.

There is statistical information that can be given to the user, these information contain the number of chicks that filled in boxes from the moment of starting work for the machine until the end of work. In addition to status information which explain the status of system if it running or stopped or paused, all these cases displayed on a LCD screen.

In our system, the user can order some commands to the machine, like stop the machine suddenly or pause it, also the user can control the system through a computer application, this feature can be happened by using arduino microcontroller, also using this device make system able to connect to a network.

Scope

This machine can be used in all poultry companies, especially in incubators.

Equipment used

Here we will talk about two ways to create sender and receiver:

The first way:

- TSOP 1738 : TSOP is a receiver that receive signal from an IR led.

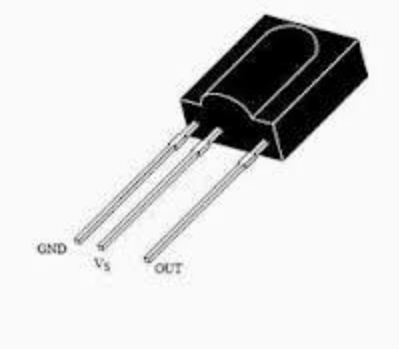

Figure 0-1: TSOP 1738

- IR Led: this tool work as transmitter in the circuit.

Figure 0-2: IR Led

We first decide to use this way to construct connection between sender and receiver. Then we change the plan to use laser radiation and LDR.

The second way:

- Laser:

Figure 0-3: Laser

- LDR:

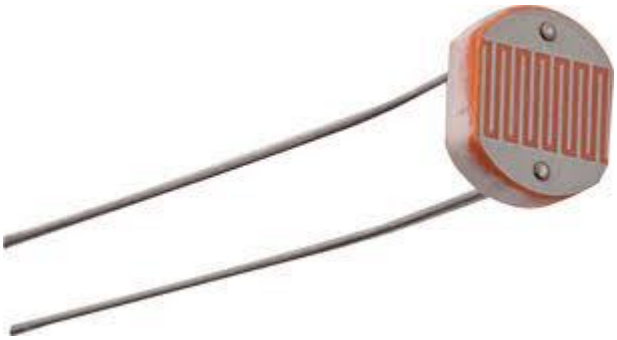

Figure 0-4: LDR

The work steps for each will be explained later.

- Transistors: the connections of transistors and their values will be shown later.
- Resistors: the connections of resistors and their values will be shown later.
- Counter: we used (ne555) counter IC.
- Arduino

Figure 0-5: Arduino

- LCD and Keypad
- DC motors
- Conveyor
- EagleCad, which is a software program used to design circuits to produce PCB.

Project challenges

Here we will talk about the challenges that must be solved in the design of project.

- Must take into account a good distance between chicks to insure that all chicks enter the counter stage.
- Ability to detect each chick enters to counter to be counted.
- To make sure there is a box to fill chicks in it.
- To make sure that each box contains a specified number of chicks.
- After filling the box, the conveyor that carry chicks to counter must be stopped to check that the filled box moved to the sterilization line and an empty box placed instead of it.
- To make sure that the sterilization line empty, so a new box can move to it.
- To make sure that the component used in system can live for a long time, also must sure that these components will not be broken after long hours of continuous working. so must be careful when choose components.
- At the end, all system must be synchronized together.

Methodology

Here the explanation for the project and design in detail, where we will consider the problems that we faced, also the ways that we used to finish this system.

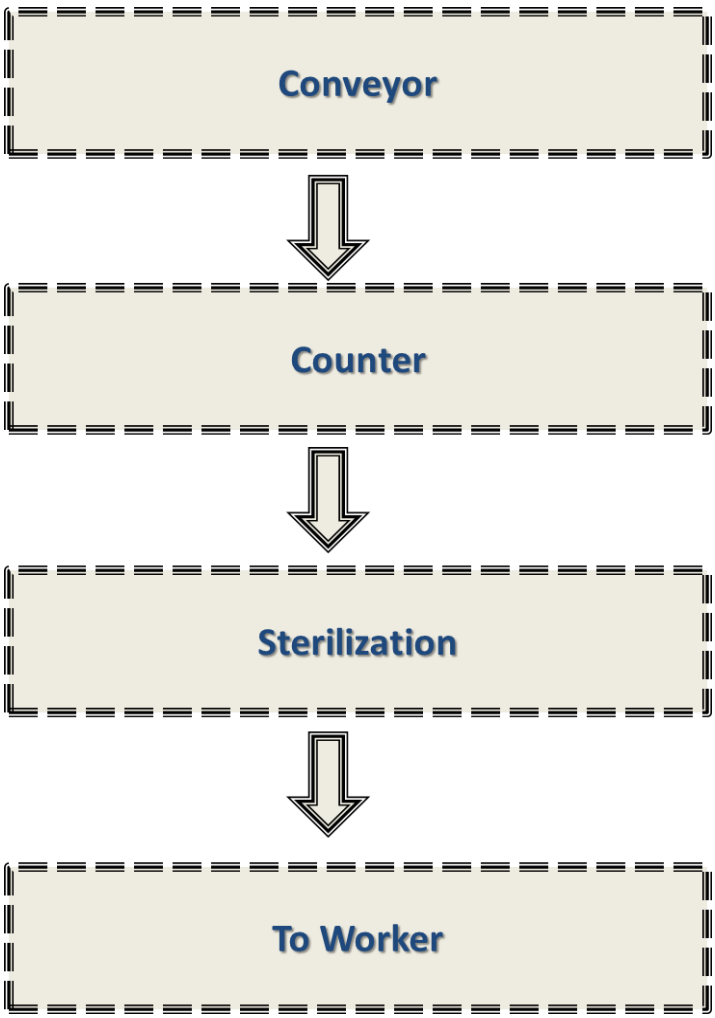

Figure 0-1: System Stages

Conveyor

Figure 0-2: Conveyor

It is a path between the area before enter the machine, and the counter which represent the second stage in the design, and from the definition we can conclude that this stage or the conveyor used to transport chicks between these two areas.

In the system we just used one conveyor and that for time constraints. At first, we planned to design two conveyors, so there will be two channels for chicks to go through. But in order to problems that we faced in the design of system and as we mentioned before due to the time constraints we decide later to design just one conveyor.

Each conveyor consists two belts, these two belts have different speed, where the second one faster than the first one and that to make sure that just one chick enter the counter, where if the speed of the first one less than the speed for the second one, there is a possibility for two chicks enter the counter together and counted as one chick, and that in its turn will effect on the allowed number for each box.

Counter

Figure 0-3: Example For System Counter

We can conclude the mission for this stage from its name. And in our system we used counter for two purposes, the first one is that to make sure that each box contains the specified number of chicks, where each box can contain just 100 chicks, and the second one is to calculate the total number of chicks that filled in boxes.

The main idea of counter that there is a signal between two sides, these two sides is transmitter and receiver which share the signal between them. When this signal cut the counter will increased by one and so one until achieve the purposes.

The high speed for the second stage of the conveyor guarantee for us that the chicks will go through the counter box. Also the counter box designed so that the end of the conveyor connected to the start of the counter box.

And now we will explain how we construct the design for the counter stage, as we explained before that the counter contain transmitter and receiver. And we have used two ways to finish this part, the first one is using TSOP and IR led, and the second one is using laser radiation and LDR.

Actually the using of the second way was a result of the problems that appeared in the first one, where the first one use TSOP as receiver and IR led as transmitter, and the IR led connected to the counter IC, and the following figures will show the circuit for each one.

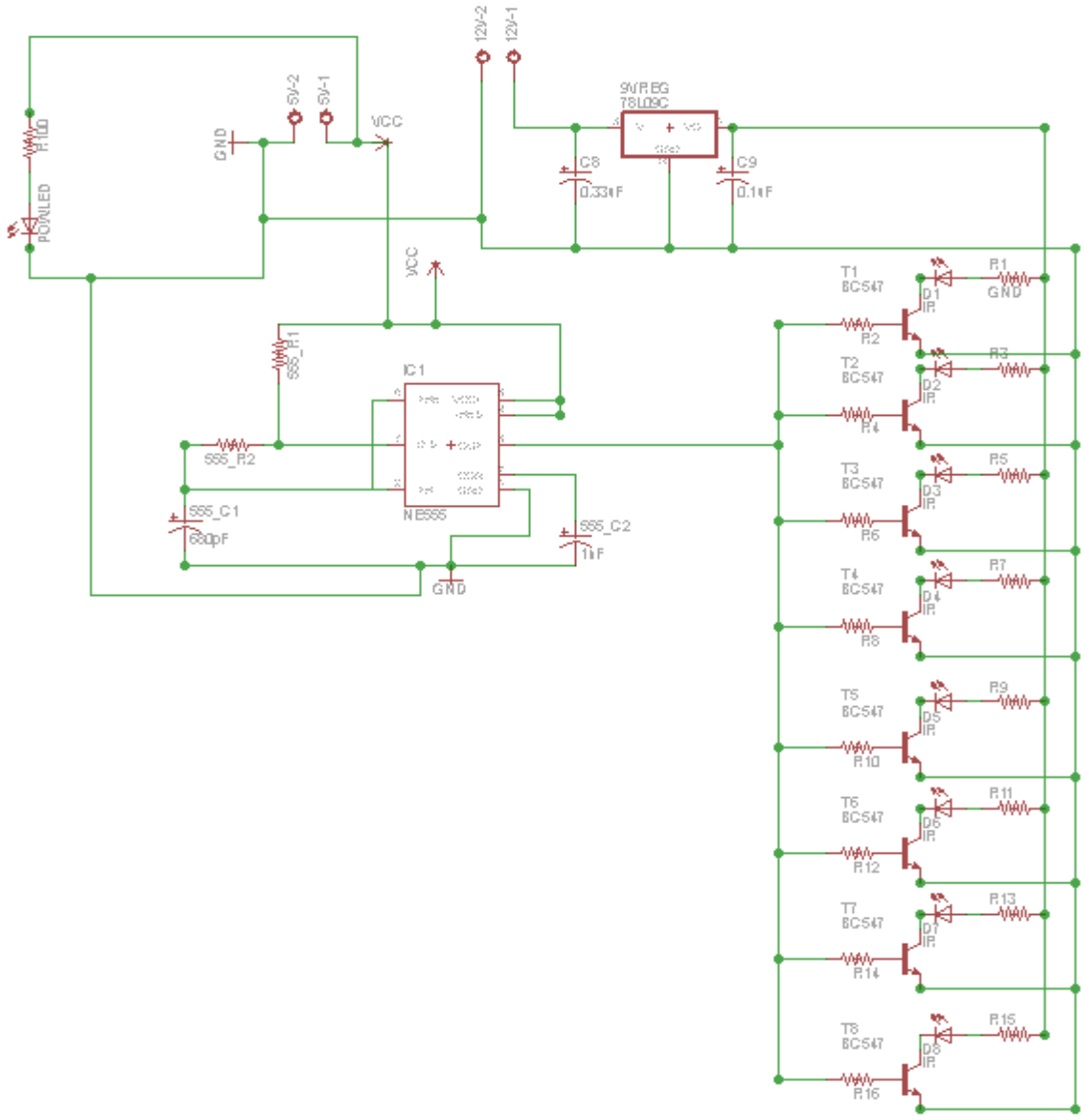

Figure 0-4: 8-IR Led connection, Transmitter

The above circuit show how the IR led which represent the transmitter connected, and as we can see there is 8 led, and there is a led just for test and to check that the circuit run correctly. The 8 led connected to the same counter IC output.

The using of 8 led come from the idea that to make sure that the chick when enter the counter must be counted, so any vertical direction the chick will go through, one of the led at least will catch it.

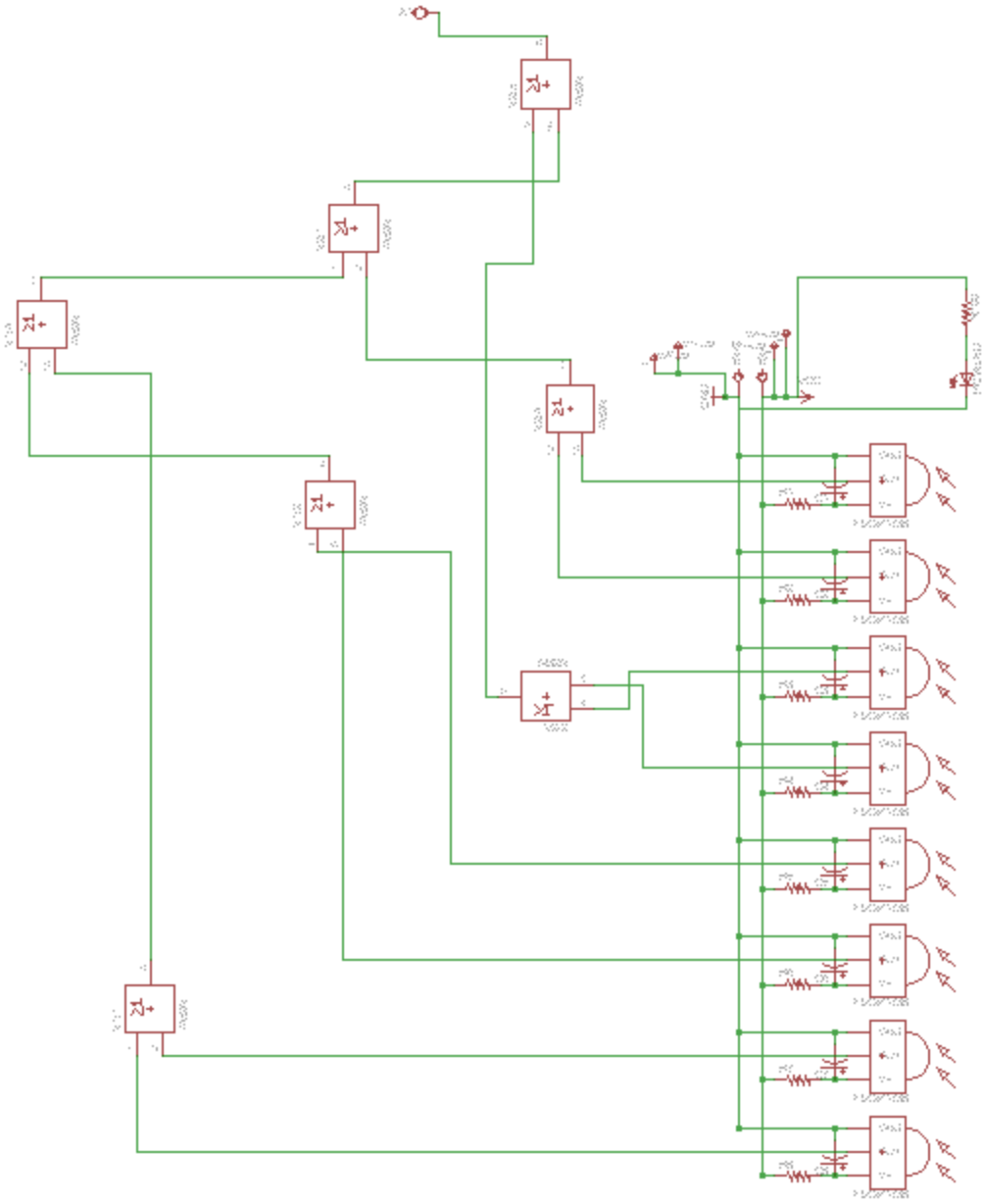

Figure 0-5:8-TSOP connection, Receiver

The above circuit shows the receiver circuit in the counter, where the main component used in this part is TSOP1738, this component receive signal from the transmitter, and while the signal not broken, the output voltage will be zero, when break the signal, the output voltage will change to 5 volt.

As we can see from the figure that there are 8 modules for TSOP, where each one stands versus one of the 8 modules of IR led. The 8 modules connected to an OR IC, so if the chick cut signals for two modules, the counter will increased just by one.

First, we try these circuits on breadboard, and everything run correctly as it supposed to. And the system still running for long time and in about 1 meter between the sender and receiver and, and this distance more than the distance that we want actually, and that is been good starting to the project, after that we start the next step which is make the PCBs for two circuits.

The following figure will show the printed circuit design for the transmitter, by EagleCad:

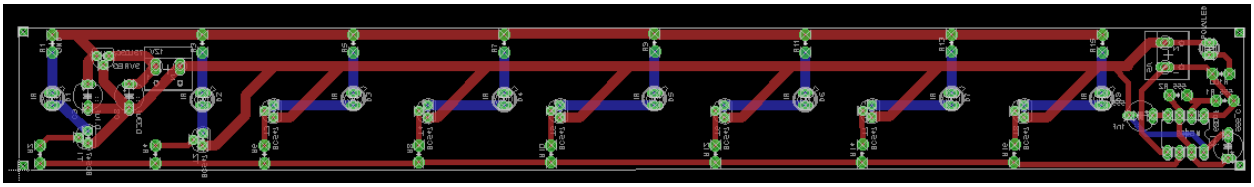

Figure 0-6: The Printed Circuit Design For IR Led, Transmitter

And now the printed circuit for the receiver, also by EagleCad:

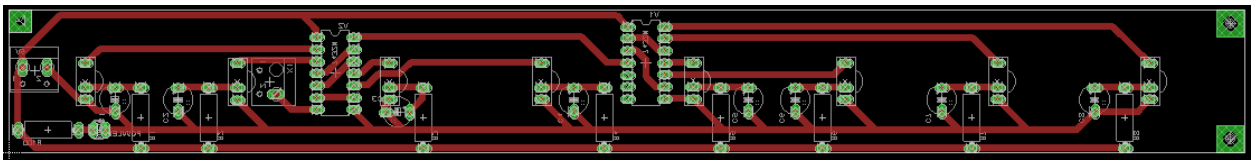

Figure 0-7: The Printed Circuit Design For TSOP, Receiver

After finishing this part and it supposed that the model will work correctly. The shock was here, where the model not works as we planned, and after search for a long time without find any error in the design, we decided to redesign the circuits and print them again. And that what we have done actually, but the result was same thing. And this was the reason to make just a small model about the original system.

At that time we decide to use other way to make the transmitter and receiver connection, this way depend on laser radiation and LDR.

The idea that the LDR resistor value changes when exposed to light. This changing will change the value of output voltage from zero to 5 volt.

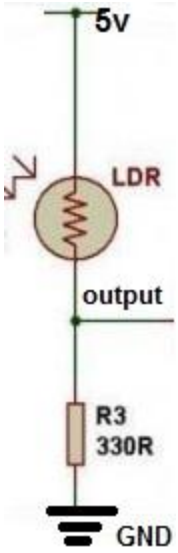

Figure 0-8: LDR Circuit

The above circuit show how LDR connected.

Figure 0-9: laser

The above figure show the laser used in the counter model, where the laser light hit the upper surface of LDR, so the output voltage will be zero in this case, when the chick break the signal between laser and LDR, the voltage will change to be 5 volt, so the system will detect that there is a chick pass the counter box.

Each chick pass the counter box goes to hole, this hole exist under the counter box, where the process of gathering chicks done in this hole. This hole contains a specified number of chicks, these number approximately 100 chicks.

When the number of chicks reaches 100, the first stage of conveyor stopped, and that to make sure that no more than 100 chicks will enter the hole.

The hole itself divided into two sections, where each section contain the half number of chicks which equal 50 chicks, also each section has a gate, and this gates used to allow chicks go to the cartoon box.

The idea of two section come from the design of the cartoon box, where the cartoon box also divided into two section, and has a cartoon barrier between these two sections, so the idea is to make the system suitable to the cartoon box.

Before the chicks go to the cartoon box, we must be sure that there is a box, and this thing can be done by using the idea of laser and LDR, where when the signal broken, that mean that there is a cartoon box, so we can fill it with chicks.

After that, the gates of the chicks' hole opened one after another, where the first gate opened to fill the first section of the cartoon box, after finishing, the second gate opened to fill the other section of the cartoon box. The cartoon boxes put on a conveyor by a worker.

Sterilization

After finishing the process of filling the chicks, the cartoon boxes move to next stage of the system, which is the sterilization stage.

The target of this stage is to put a chemical stuff on the uncovered cartoon boxes which contain chicks.

Before the cartoon box enter the sterilization line, the system must make sure that there is no boxes on the line start of the sterilization conveyor, and that done by putting using the laser and LDR idea. And here, it doesn't matter if the sterilization area empty or not.

When there is a cartoon box in the sterilization area, the conveyor that transports the boxes will stop, until finishing the process of sterilization. And that in its turn will prevent any two boxes to enter the sterilization area together.

To worker

After finishing the process of sterilization, the conveyor will pass the cartoon box to the worker, to cover.