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Automatic Seed Counting System

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***Abstract*— As we all know India is the nation of agriculture and farmers being the backbone of India are constantly in need of seeds for harvesting and cultivating. The existing type of seed measuring system involves the weighing the seeds approximately and packing them or processing them. So the focus of the project is on building a system which could tackle the problem of inaccurate seed measurement and counter the accurate number of seeds. For this purpose IR sensor based counting system which would operate the belt conveyor after certain number of grains/seeds falls in the box and the next box comes into the cycle. This circuit is configured using a microcontroller and a counter display LED for displaying the counts.**

Keywords – ***Microcontroller, seed counter, counting system, infrared sensors.***

1. INTRODUCTION

India is agrarian economies and most of rural populations depend on agriculture to earn their livelihood. Agriculture is the largest livelihood provided in India mostly in the rural areas. The farmers are in need of seeds for ploughing & cultivation. The seeds are available in packets & many industries deal in manufacture of such seed packets.

Our project deals with providing accurate seed measuring machine with affordable cost and high efficiency. It consists of different mechanisms for separating & counting the seeds from the feeder and for transporting them. The complete process is controlled using a micro controller and performs all the operations in a sequence. It is actuated by motors, vibrator for seed flow, counter for counting specific amount of seeds and a timer for operating different operations accurately without harming the seeds. Aimed at increasing the productivity and reducing the labour involved, this device/machine is designed to execute the basic functions required to be carried out in the seed packaging industries. The operation starts when the seeds are poured into the feeder & the vibrator circuit is activated, creating a clean flow of the seeds into the pipe without obstructions and then the seeds coming out are counted & the for specific number of seeds the nozzle is blocked and the transport system is operated bring the next collecting box into the nozzle field.

2. LITERATURE REVIEW

The survey was made to collect the information in the journal papers about the existing devices related to the project.

- Seed Weighing & processing device:

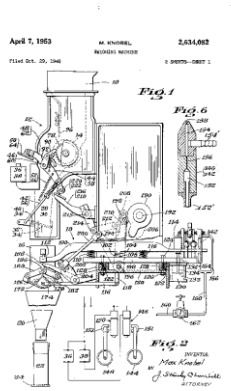


Figure No. 1. Seed weighing device[#7]

Table No 1. Patent Information

Publication Number	US2634082 A
Publication Type	Grant
Publication Date	7 Apr 1953
Inventors	Knobel Max
Original Assignee	Pneumatic Scale Corp

7

- *Photoelectric Seed Counter:*

The counter outlined in this paper overcomes these problems through use of different components. A photodiode is used as the sensing device that permits seeds of specific sides to be resolved as separate pulses. Mounting the sensor and light assembly on a V-shaped trough may make an assembly that will count seeds.

Small scale yield studies, germination tests, controlled plantings, and packaging often require the counting of large numbers of seeds. The system described in this paper uses a photosensitive detector and a vacuum pickup to count individual seeds and gives a direct digital readout. The count rate is limited only by how quickly the seeds can be fed through the counting tube without clogging it or having them touch each other. This greatly seed counting, eliminates operator error, and fatigue. With the addition of a relatively simple predetermining circuit, a fixed number of seeds may be counted and a control function can be exercised. This capability is immediately applicable to packaging or repetitious

Witching of seeds. Zero error for any given number of seeds is attainable if the seeds are fed through the count tube carefully because of the completely digital nature of the circuit.

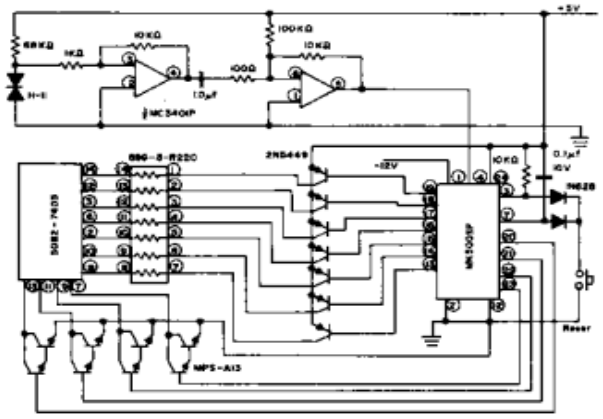
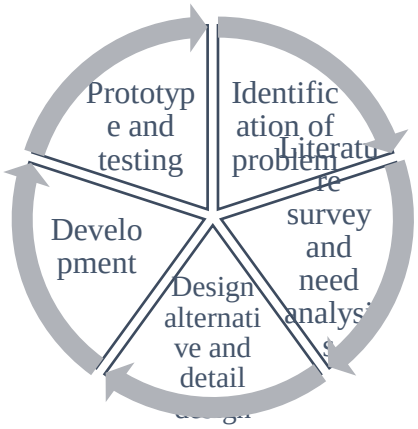


Figure No 2.Photoelectric Seed Counter[#8]

3. METHODOLOGY

Methodology is the systematic, theoretical analysis of the methods applied to the field of study, or the theoretical analysis of the body of methods and principles associated with a branch of knowledge.



FigureNo 3. Methodology

3.1 Functional analysis

The functional analysis method offers such a means of considering essential functions and the level at which the problem is to be addressed. The essential functions are those that the device, product or system to be designed must satisfy, no matter what physical components might be used. The problem level is decided by establishing a boundary around coherent subset of functions. [8]

Functions

- Detection of the seeds
- Sequencing & flow of seeds.
- Counting of seeds
- Collection of seeds in a box
- Actuation of transport system.

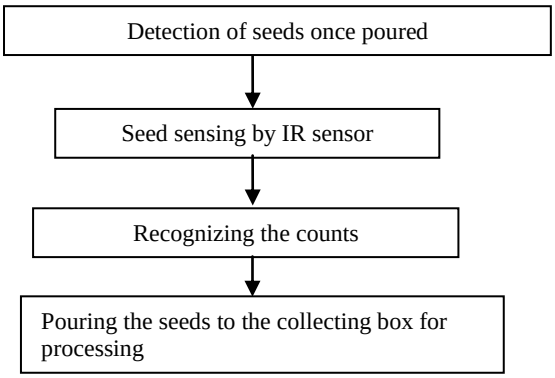


Figure No 4: Flow diagram of functions

3.2 Design

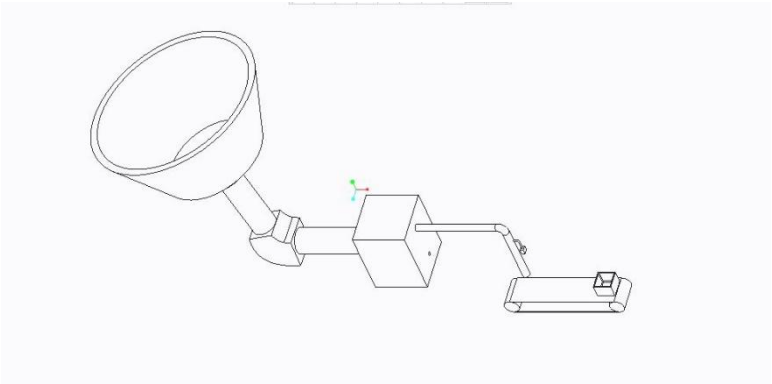


Figure No 5: Final Design

Seed counting machine with a output with belt conveyors & Proximity Sensor and Atmega 328(Arduino UNO) microcontroller.In this mechanism, first the seeds are detected & then the seeds separations/ flow is done by vibrator setup and seeds are fed into a pipe and then the seeds are dispatched into boxes and counting is done by proximity sensor. Then the flow is stopped after certain count is done

3.3 Detailed design

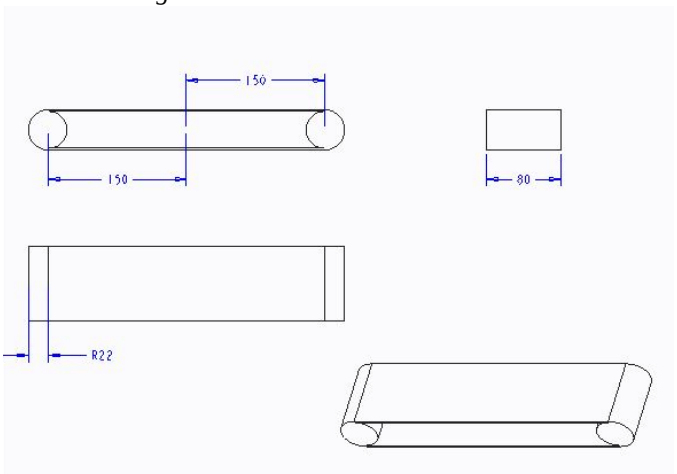


Figure No 6. Belt Conveyor

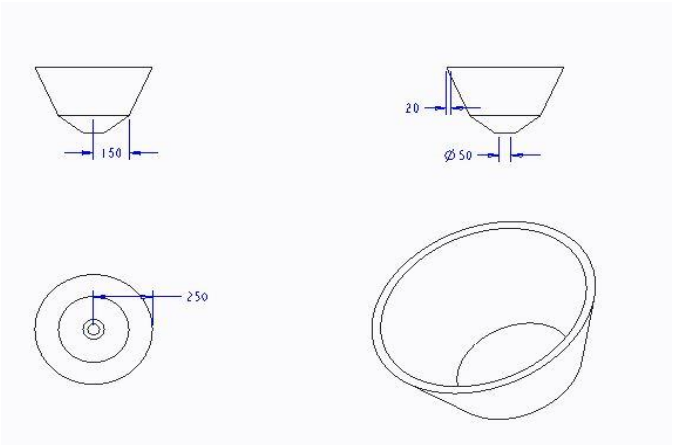


Figure No 7. Hopper/Feeder

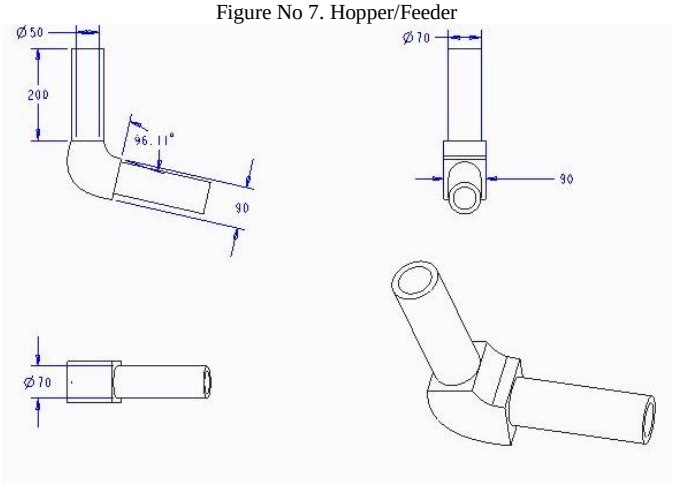


Figure No 8. Pipeline Design

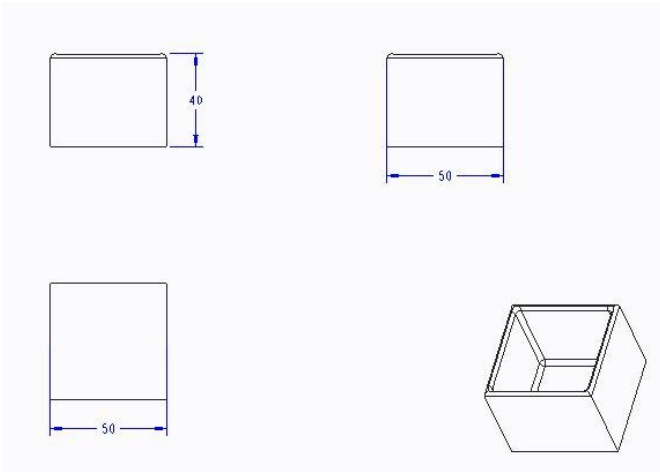


Figure No 9. Dispatch Box

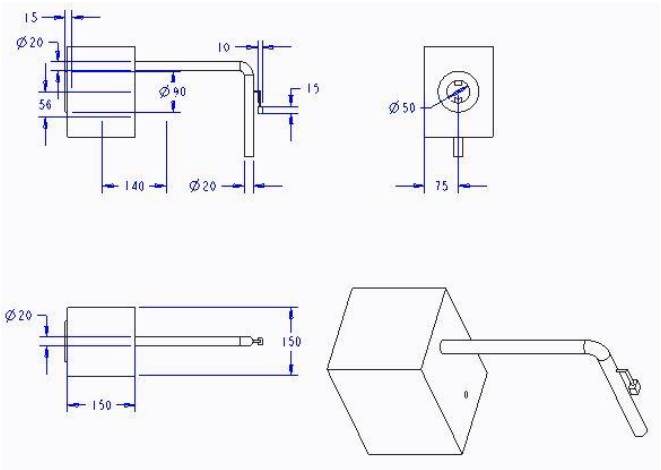
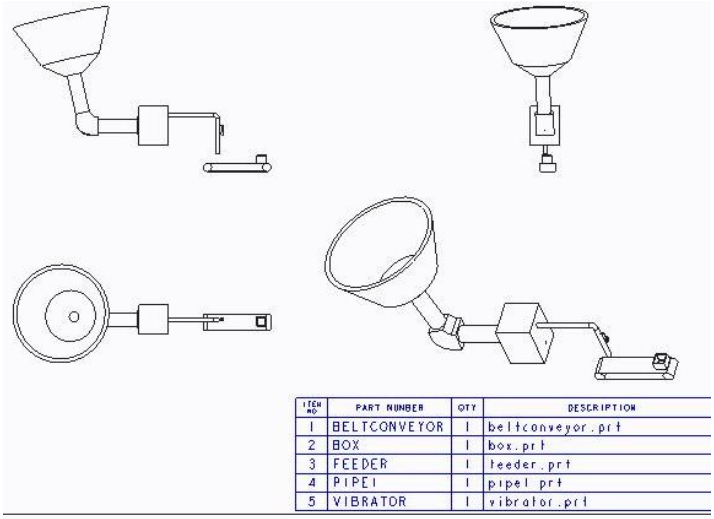


Figure No 10. Vibrator/Separator



ITEM NO	PART NUMBER	QTY	DESCRIPTION
1	BELTCONVEYOR	1	beltconveyor.prt
2	BOX	1	box.prt
3	FEEDER	1	feeder.prt
4	PIPE1	1	pipe1.prt
5	VIBRATOR	1	vibrator.prt

Figure No 11. Assembly

FABRICATION DETAILS

Thischapterpresentsthe variousmanufacturingprocessesusedinthefabricationof the machine.Themanufacturing processeslikewelding,soldering,drilling arediscussedin detail.

Components:

- *Vibrator:* Used in the device at the hopper side for proper flow of seeds without queuing at the nozzle. This produces vibrations when its circuit is ON-ed.

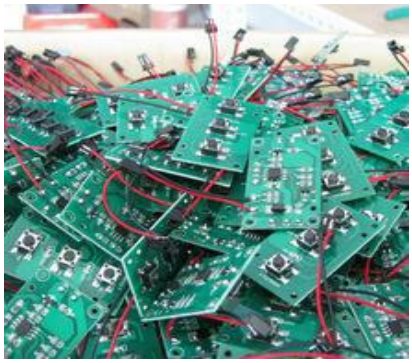


Figure No 12. Vibrator Circuit

- **Servomotor** (GS4060BB): This is used to block the nozzle when the specified quantity of seeds are collected in the box and the further flow is to be stopped.

Figure No 13. Servomotor

- **Infrared Sensor**: This sensor is used in the circuit to sense the number of seeds falling in the collector box and this sends the signal so that counter can count it.

Figure No 14. IR Sensor

- **Arduino Atmega 328**: Microcontroller is used as an interface between the components and is used to enter the programme and execute it. Atmega 328 is of high efficiency and considerably low in cost.

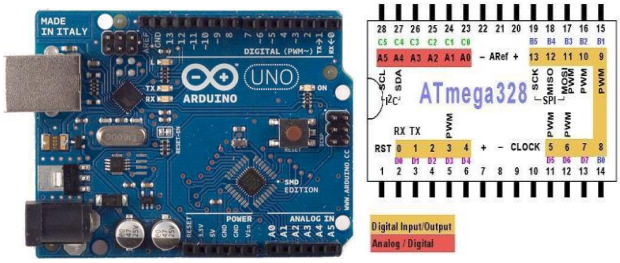


Figure No 15. Arduino Circuit

- **LCD**: LCD is used to display the count number i.e. the number of seeds sensed by the sensor and updated by the counter.

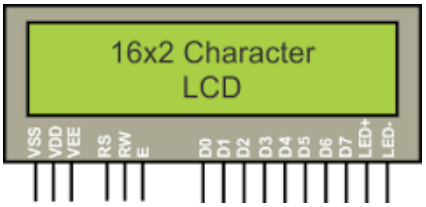


Figure No 16. LCD

- **L293D Motor Driver**: Used as the interfacing unit between the microcontroller and motors for sending the commands from the microcontroller about the actuation to the motors.

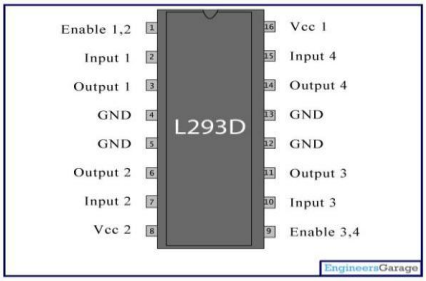


Figure No 17. Motor driver Module

- **Supporting frame-** Rectangular frame made from the stainless steel for holding the electronic components and other parts as shown.

Figure No 18. Frame

FABRICATION PROCESS:

1. **Arc Welding**: Arc welding is a welding process, in which heat is generated by an electric arc struck between an electrode and the work piece. Electric arc is luminous electrical discharge between two electrodes through ionized gas. Any arc welding method is based on an electric circuit consisting of the following parts:

Power supply (AC or DC),
Welding electrode,
Work piece,
Welding leads (electric cables) connecting the electrode and work piece to the power supply.

Electric arc between the electrode and work piece closes the electric circuit. The arc temperature may reach 10000°F (5500°C), which is sufficient for fusion the work piece edges and joining them. When a long join is required the arc is moved along the joint line. The front edge of the weld pool meltsthe welded surfaces when the rear edge of the weld pool solidifies forming the joint.

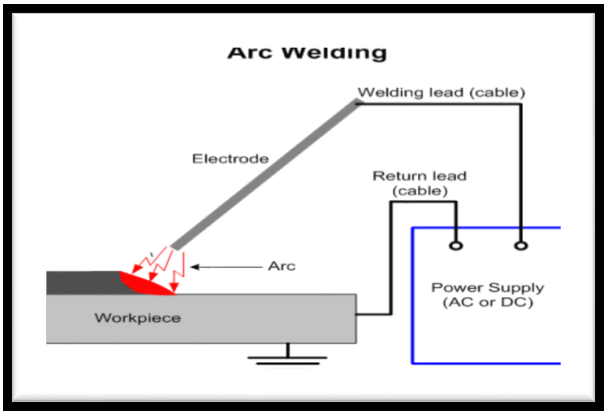


Figure No 19. Arc Welding

When a filler metal is required for better bonding, filling rod (wire) is used either as outside material fed to the arc region or as consumable welding electrode, which melts and fills the weld pool. Chemical compositions of filler metal are similar to that of work piece. Molten metal in the weld pool is chemically active and it reacts with the surrounding atmosphere. As a result weld may be contaminated by oxide and nitride inclusions deteriorating its mechanical properties. Neutral **shielding gases** (argon, helium) and/or **shielding fluxes** are used for protection of the weld pool from atmospheric contamination. Shields are supplied to the weld zone in form of a flux coating of the electrode or in other forms. This is used for fabricating the frame and attaching the hopper and other metallic components to frame.

2. **Drilling**: Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circularcross- section in solid materials. The drill bit is a rotary cutting tool, often multipoint. Thebit is pressed against the work piece and rotated at rates from hundreds to thousandsof revolutions per minute. This forces the cutting edge against the work piece, cutting offchips (swarf) from the hole as it is drilled.

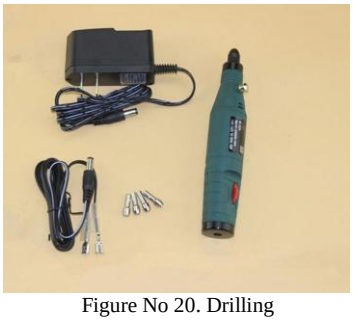


Figure No 20. Drilling

3. **Soldering**: Soldering a process of joining parts or electrical components like wires to the circuit etc. This process involves a solder gun and solder flux material which is heated above the meltingpoint and applied between the wires to complete the connection routes.

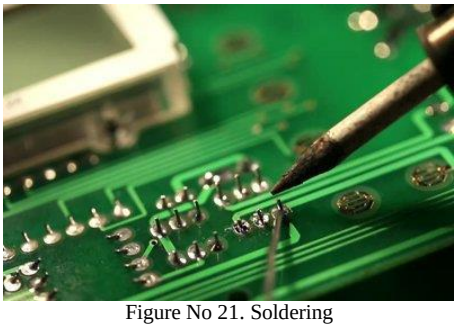


Figure No 21. Soldering

MICROCONTROLLER PROGRAMMING

```
// Sweep
// by BARRAGAN <http://barraganstudio.com>
// This example code is in the public domain.


 // create servo object to control a servo
            // a maximum of eight servo objects can be created
#include <LiquidCrystal.h>

// initialize the library with the numbers of the interface pins
LiquidCrystallcd(12, 11, 5, 4, 3, 2);

int motorpin1 =8;
int motorpin2 =13;
int motorpin41 =9;
int motorpin42 =10;
intpos = 0;    // variable to store the servo position
intsensorValue=0;
int IR1 = 6;
int IR2 = 7;
int IR3=10;
int IRState1=0;
int IRState2=0;
int IRState3=0;
intcnt=0;
intflg=0;
void setup()
{
  // attaches the servo on pin 9 to the servo object
Serial.begin(9600);
 // pinMode(pushButton, INPUT);
pinMode(motorpin1,OUTPUT);
pinMode(motorpin2,OUTPUT);
pinMode(motorpin41,OUTPUT);
pinMode(motorpin42,OUTPUT);
pinMode(IR1, INPUT);
pinMode(IR2, INPUT);
pinMode(IR3, INPUT);
lcd.begin(16, 2);
  // Print a message to the LCD.
lcd.print("Seeds count:");
}
voidmove_con()
{
digitalWrite(motorpin1,LOW);
digitalWrite(motorpin2,HIGH);
delay(1);
}
```

```
voidstart_vib()
{
digitalWrite(motorpin1,HIGH);
digitalWrite(motorpin2,LOW);
delay(1);
}

void loop()
{ move_con();

sensorValue = analogRead(A0);
Serial.println(sensorValue);
if(sensorValue> 100)
  {
start_vib();
if(flg==0)
  {
digitalWrite(motorpin41,HIGH);
digitalWrite(motorpin42,LOW);  //open
delay(100);
  }
flg=1;
digitalWrite(motorpin41,LOW);
digitalWrite(motorpin42,LOW);
delay(1);
while(cnt<25)
 {
 IRState1 = digitalRead(IR1);
   IRState2 = digitalRead(IR2);
if(IRState1 ==1 || IRState2 ==1)
   {
cnt =cnt+1;
   }

Serial.println(IRState1);
Serial.println(IRState2);
Serial.println(cnt);
lcd.setCursor(0, 1);
  // print the number of seconds since reset:
lcd.print(millis()/1000);

lcd.setCursor(10, 1);
  // print the number of seconds since reset:
lcd.print(cnt);
delay(1);
 }
move_con();
delay(2000);
cnt=0;
}
if(flg==1)
 {
digitalWrite(motorpin41,LOW);
digitalWrite(motorpin42,HIGH);   //Close
delay(100);
flg=0;
 }
digitalWrite(motorpin41,LOW);
digitalWrite(motorpin42,LOW);
delay(1);
move_con();

}
```

TESTING AND VALIDATION:

The testing is carried out for the system by using the software Proteus which can be used to analyzecircuit. The designed circuit is fed into the system and the flow of current is analyzed and the pointsand which the probable problem can take place can be determined and eliminated.

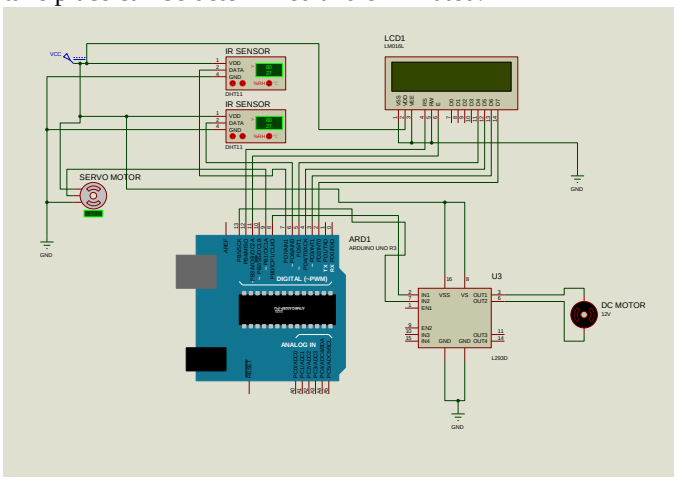


Figure No 22. Circuit

The testing depicts the power in and out at each component of the circuit and the timer delay givenand the output operation time can also be determined/analyzed. This testing helps in selecting the best circuit design and achieve the outputs properly as planned for.

VALIDATION:

- This device can be further developed for automated packaging after the counting is done.
- This system can be implied for tablets counting with some modification in the systems.
- Using of high efficient digital camera can be used instead of sensor for measuring smaller grains/seeds.

4. CONCLUSION

The seed counting device has been designed to carry out all the elementary functions in seed measuring and processing unit. It is expected that the system will operate effectively and dispensing accurate number of seeds. It is aimed at increasing the productivity and reducing the labor involved. The device performs the tasks like counting the seeds, dispensing them in the collector box, actuating the conveyor automatically in a sequence without human intervention.

Thus an effort is made so that the device increases productivity and assists the seed packagingIndustries. The design is accepted and unique compared to the existing measuring machines.

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