A

Project Report

on

Design and Development of Step Lift

submitted to

Sant Gadge Baba Amravati University,
Amravati (M.S.) 444 602

in partial fulfillment of the requirement

for the degree of

BACHELOR OF ENGINEERING
in
MECHANICAL ENGINEERING

by

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Certificate

This is to certify that the project report entitled **"Design and Development of Step Lift"** is hereby approved as a creditable study carried out and presented by

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in manner satisfactory to warrant of its acceptance as a pre-requisite in a partial fulfillment of the requirements for the degree of Bachelor of Engineering in Mechanical Engineering of Sant Gadge Baba Amravati University, Amravati during the **Session 2022-23.**

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Acknowledgement

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Shrushti Lade

Abstract

Today's world, elderly people are facing problem like mobility going from one level to another to is this situation of them a prototype is design of step left which is easy to use cheap and fast and safe for moving from one place to another and it can be installed easily without any civil constructions. This paper discuss the design calculation consideration of length, speed capacity, roller diameter, motor, timing belt, and timing pulley and how much weight the platform can hand. It also gives the idea of the angle and axis of rotation how the transmitter and receiver is used even the sensors which are being used to detect the objects.

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CHAPTER 1

INTRODUCTION

The health care system depends depending on the type, quantity, size, and weight that it can handle to be transported, as well as the handling speed and transportation height. Various means like escalators, bucket elevators, conveyor systems, forklifts, etc., have been identified for lifting and transporting people from one place to another. However, the industry's infrequent halts or fatalities during loading and unloading are cause for alarm. The purpose of this study the purpose of this effort is to create a design data base for the creation of a dependable and efficient belt conveyor system that will cut costs and increase production while also lowering risks to people who operate them. Conveyor systems are mechanical systems that transport objects from one place to another. Many processing and manufacturing industries use them, including chemical, mechanical, automotive, mineral, pharmaceutical, and electronics.

Manual handling makes transporting from one level to another simpler, safer, faster, more efficient, and less expensive. The efficiency of load carrying equipment and facility design contribute to a firm's performance level. Conveyor systems are long-lasting and dependable modes of transportation. Conveyor systems are classified as gravity, belt, granular conveyor systems include screw, bucket, vibrating, pneumatic/hydraulic, chain, spiral, and others.

Fig1.1.Handicapped Person

The decision is influenced by several factors, including the quantity of passengers, the rate of travel, the size and weight of the passengers, and the distance or level of travel. However, the degree of mechanisation is determined by the handling needs. Handling entails moving individuals from the ground to the highest floor and back again. It entails transferring weight from one level of construction to another. A belt conveyor is made up of a continuous and High-strength flexible belt having two end pulleys (driver and driven) supported by rollers at fixed places. In this task, two timing pulleys are necessary for proper material support and belt safety along its length. A drive system gear box powered by an electric motor uses pulleys to provide drive to the belt. It also aids in keeping the belt taut. The drive system provides power to any number of pulleys in order to move a belt and its loads. The friction created between the moving belt and the rolling surface, which is propelled into motion by a rotating pulley (drive pulley), is what moves people across the required distance.

Uniquely, a belt conveyor is easy and affordable to maintain, has a high conveying and receiving capacity, and can transport heavy objects affordably and efficiently over long distances while permitting relative material mobility. Only one the mechanism that drives the roller must be driven by the driver pulley, and the roller must spin continuously in order to propel the components. Material handling equipment such as belts and platforms are intended to load and unload materials from one phase of manufacturing to the next in the quickest, smoothest, most sensible, safest, and most cost-effective manner possible. Numerous operations in industrial flow paths. A belt conveyor can be horizontal, incline or drop, or all three at once. The timing belt's height can be changed with the help of a pneumatic cylinder, allowing for variable loading and unloading heights.

Fig.1.2.Elder Person

Chapter 2

LITERATURE REVIEW

1. **Smart stair lift for disable and elderly:** Presents a stair lift with a powered rail that is controlled via the internet of things (IOT). The chair is coupled to a motorised rail so that the person can be carried. The chair moves using a Wi-Fi connection controlled by a node mcu that is linked to a mobile app with a range of 15-200 m. It is capable of supporting weights of up to 1000kg.

Fig.2.1. Final Product of 1

2. **Development of stair with escalator (Stair Lift):** The cable and pulley mechanism is used to build the system. When an electric supply is applied to the AC single phase induction motor, which begins rotating at 1400 rotations per minute and then connects with the Oldham's coupling, the output shaft of the coupling is connected to the worm speed reducer, which reduces the 1400 rpm to 72 rpm and is then connected to another Oldham's coupling, pedestal bearings, and finally the wrench. The wrench winds the rope, which has one end tied to it and the other end connected to the platform. The individual ascends as the rope is wrapped. This is how the mechanism of steps with escalators (stair lift) works, and the person or thing is lifted.

Fig.2.2. Final Product of 2

3. **Design and fabrication of staircase sliding lift for G+2 existing structures:** A rope drive, a motor, a reduction gearbox, two rails, and a sliding platform make up this electric slider. System with a rope and pulleys. The motor's capacity entirely controls the machine's ability to support weight. We decided to load a maximum of 15 KN, or 150 kg of standing people and a platform-equipped frame.

Fig.2.3. Final Product of 3

4. **Electrically operated stair lift for different able person*:*** The exhibited model is a battery-powered electric wheelchair that can climb stairs thanks to a belt drive located on the chair's backside. It has a forwarding switch. Rearward, starts and stop. When the start button is pressed, the hatter driven belt starts to rotate along the path that is forward when the forward button is pressed, and the same occurs when the seat is brought with the reverse button. When compared to other model, this entire arrangement is more portable and user-friendly.

Fig.2.4. Final Product of 4

5. **Designing and analyzing stair case lift system:** The president or elevating platform is attached to the rail. To transmit the cargo, a DC. Electrical motor is coupled to a rack and pinion gear. The advantages of this case involve simple installation, low cost, and no need for conservation or a great amount of space. Using the Solid works design programmer, developed and anatomized the equipment (president and rail together) and gear system in this study. For the analysis, the maximum cargo weight is 95 kg.

Fig.2.5.Final Product of 5

6. **Design and Fabrication of Stair Climbing Mechanism to Lift Load over Stair**: The rope and pulley medium is used to create the system. A rail is installed on the stairs, and a platform is affixed to it. When a person steps onto the platform, the Oldham connection connects the motor's shaft to the gearbox (speed reducer) when the motor starts. The spindle receives power from another Oldham's connection via the outlet shaft of the gearbox, enabling the spindle to wind or decompress the rope. Platform height can be changed by wrapping or unwrapping the rope.

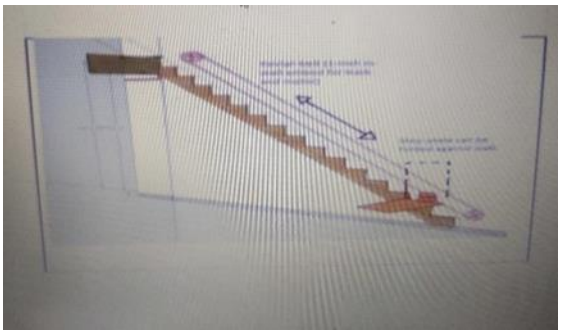

Fig.2.6.Final Product of 6

Chapter 3

OBJECTIVES

- To have mobility for elders to move from one level to another.
- Budget friendly system.
- Easy to use.
- Easily installable.

Chapter 4

EXISTING DESIGN

ROPE AND PULLEY

A rope and pulley mechanism is a simple yet versatile mechanical system that utilizes pulleys and a rope or cable to transmit force or motion. It consists of one or more pulleys and a flexible rope threaded through them. Pulleys are wheels with grooved rims designed to guide and support the rope. They can be fixed or movable, and they change the direction of the applied force. Fixed pulleys only alter the direction, while movable pulleys provide a mechanical advantage by reducing the force needed to lift a load.

The rope is threaded through the pulleys, creating a connection that enables the transfer of force. By pulling one end of the rope, force is applied, causing the load to move. The arrangement and combination of pulleys determine the mechanical advantage achieved.

Rope and pulley mechanisms find various applications, such as in cranes, flagpoles, theater rigging systems, and weightlifting machines. They offer a simple and efficient way to change the direction of forces, increase mechanical advantage, and manipulate heavy objects with reduced effort. The versatility and effectiveness of rope and pulley systems make them widely used in both industrial and everyday settings.

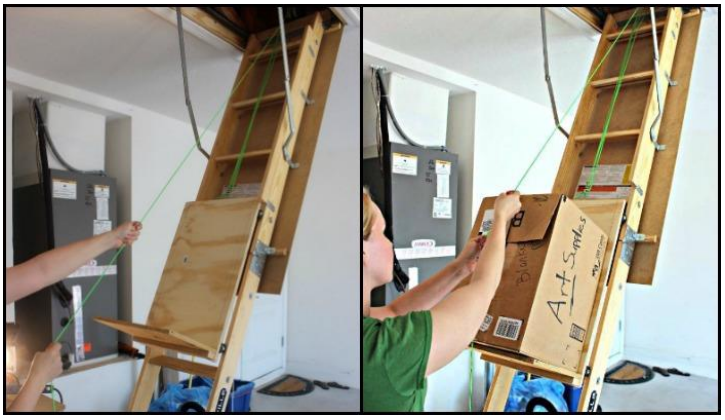

Fig.4.1.Rope &Pulley

RACK & PININO

You may have heard the term "rack and pinion" being used in reference to the steering in a car. It refers to a system in which a circular gear (known as a pinion) moves over a flat or linear gear (known as a rack). Also known as a "gear and teeth" setup, it allows for steady and stable movement.

While these mechanisms can be dangerous to curious little hands and paws, most modern stairlifts hide them.

The mechanism drives the chair up and down the track and is often battery-powered. The battery will need to be recharged regularly to ensure that it doesn’t fail at crucial moments, but the charging process is very simple.

Rack and pinion is considered to be one of the most effective methods. It doesn't drain too much power and doesn't require a great deal of maintenance, although the user will need to follow some basic home care tips to ensure that the stairlift remains operational for many years to come.

Fig.4.2. Rack & Pinion

CONVEYOR BELT

A conveyor belt is a looped belt that is driven by and wrapped around one or more pulleys. It is powered by an electric motor and supported by a metal plate bed or rollers upon which the conveyor belt rests. The pulley that powers a conveyor belt is referred to as the drive pulley and has an unpowered idler pulley.

Pulley drives at the discharge end of a conveyor belt are referred to as head drives, while ones located at the in feed end are known as tail drives. The preferred type of pulley drive is a head drive located at the discharge end and uses pull force to move a conveyor belt.

There is an endless number of types and uses for conveyors. All of the varieties serve the purpose of transporting materials and goods along a continuously moving path. Though motorized conveyor belts are the traditional form of a conveying system, some systems use rollers without a motor to move materials.

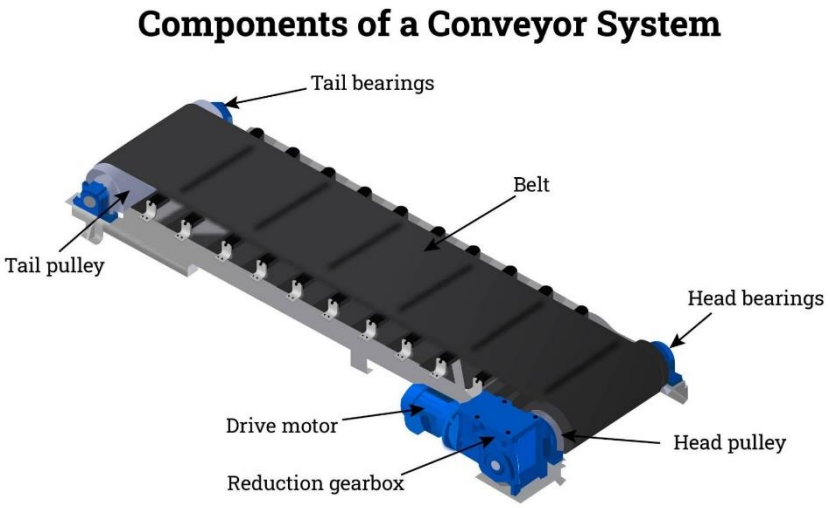

Fig.4.3.Conveyor System

ELEVATOR

A lift mechanism, also known as an elevator, is a complex system designed to vertically transport people or goods between different levels of a building. It consists of several key components and technologies. The main components of a lift mechanism include an elevator car or cab, a system of counterweights, a control system, and a network of cables or ropes. The car is the platform that carries passengers or goods, while counterweights help balance the load and reduce the power required to operate the lift. The control system manages the operation of the lift, including starting, stopping, and floor selection.

The lift mechanism operates by using electric motors to drive a system of pulleys and cables. The cables are attached to the car and the counterweights, creating a balanced system. When an elevator is called to a particular floor, the motor activates and the pulleys move the cables, causing the car to ascend or descend.

Safety features such as limit switches, brakes, and emergency systems are incorporated into lift mechanisms to ensure passenger safety. These features detect anomalies, control speed, and provide emergency evacuation options in case of power failure or other emergencies.

Lift mechanisms are essential in high-rise buildings, hospitals, shopping malls, and other structures where efficient vertical transportation is required. They provide convenient and reliable means of moving people and goods between floors, enhancing accessibility and productivity within buildings.

Fig.4.4.Elevator

ESCALATOR

An escalator is a mechanical system designed to move people between different levels of a building in a convenient and efficient manner. It consists of a continuous loop of steps or treads that move along a pair of tracks in an inclined position.

The escalator mechanism involves several key components. The steps are attached to chains or belts that form a closed loop, which is driven by a motor and gears located in the escalator's truss structure. The motor provides the necessary power to move the steps.

At the top and bottom of the escalator, there are comb plates that interlock with the steps, ensuring a smooth transition for passengers when getting on or off the escalator. Skirting brushes or panels are installed along the sides of the escalator to prevent items from falling into the mechanism.

Safety features are crucial in escalator mechanisms. Emergency stop buttons, sensors, and safety switches are installed to detect anomalies and halt the escalator's operation if necessary. Skirt and step sensors also provide additional safety measures.

Escalators are widely used in airports, shopping malls, train stations, and other high-traffic areas. They provide a continuous flow of people, eliminating the need for them to climb stairs. The mechanism offers convenience, efficiency, and improved accessibility for vertical transportation within buildings.

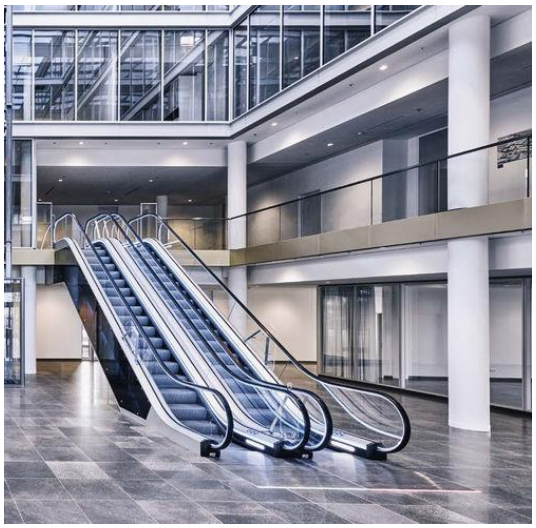

Fig.4.5. ESCALATOR

Limitations in Existing Design

- Rope and pulley there are chances of braking of rope and system will moved in downward direction with help of gravity.
- Rack and pinion needs railing or wall support for installation.
- Conveyor system require lot of space and support from both sides.
- Escalator can’t be installed at houses since it’s not budget friendly.
- Lift needs civil construction also permission from authority for installation.

Chapter 5

DESIGN AND DEVELOPMENT OF STEP LIFT

- Design the system in such a way that mechanism will be inside and can be carried anywhere and can be installed easily as well.
- Platform is given for the person to stand, when not in use the platform can be closed so that it person which are passing by will not get hurt.
- Remote is attached to handle which is connected to the platform, for easy use.
- It require small space of for the system to work.

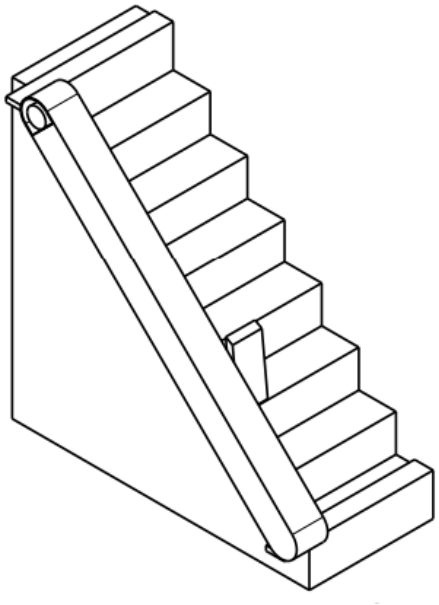

Fig.5.1.Design of Step Lift

Existing design needs wall support system as well as railing support for installation. Which include extra charge for installation also if railing system is there then for mechanism we need to pay extra to buy and install the system at home. I have made changes in design so that you will not have to pay for the installation of machine and buy railing and stair lift mechanism differently, also no wall support is needed for the installation, it can put to use without it.
In this I have put the conveyor system in box, also I have attached a platform to it for the person to stand on it, further more I have attached to remote to a handle which is attach to the platform.

When the person is standing on the platform there will be two switches for forward and reverse direction. The system will forward and backward till the person is pressing the switch, if the switch is not pressed then he system will stop moving then and there.

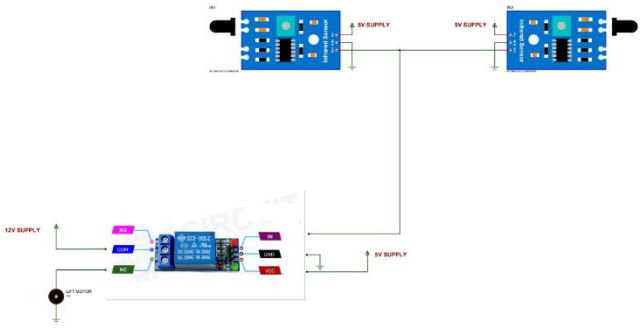

Fig.5.2.Sensor Model

Main components

- Motor
- Sensor
- Pulley
- Timing Belt
- Motor Driver
- RF transmitter Receiver
- Encoder Decoder
- Voltage Regulator

System consist of two portion mechanical and electronic system. In mechanical system, timing pulley is fitted with the motor and shaft. While the electronics system consists of sensors, motor driver, RF transmitter receiver and encoder decoder. Switch is gives signal to RF receiver, decoder detects which direction command is given forward or backward, motor moves according to the given direction and the platform moves with it. Motor driver helps to control the speed of the motor. Sensor is attached to relay and it is connected to motor. Everything is connected in series system. IR sensors detect the object and stops the motor few distance away, so for this two sensors are used in one relay. All of this has main power of 12V supply and a 5V is used for relay and sensor.

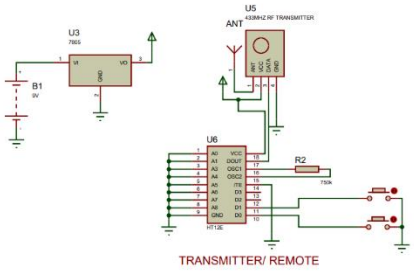

Fig.5.3.Transmitter Remote

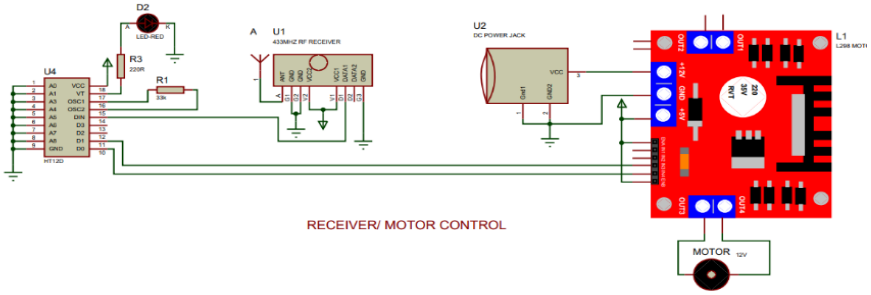

Fig.5.3.Receiver Control

Chapter 6

METHODOLOGY

This project works on the principle escalator system. I use motor for the rotation of timing belt. Also the other end has freewheel for the proper rotation, the timing pulley is attached to the motor and shaft. The motor one part is connected to the motor driver and another to the relay module. The motor driver controls the speed of the motor. The motor driver is connected to the main power source and also the receiver system, also the power supply connection is given to the receiver system.

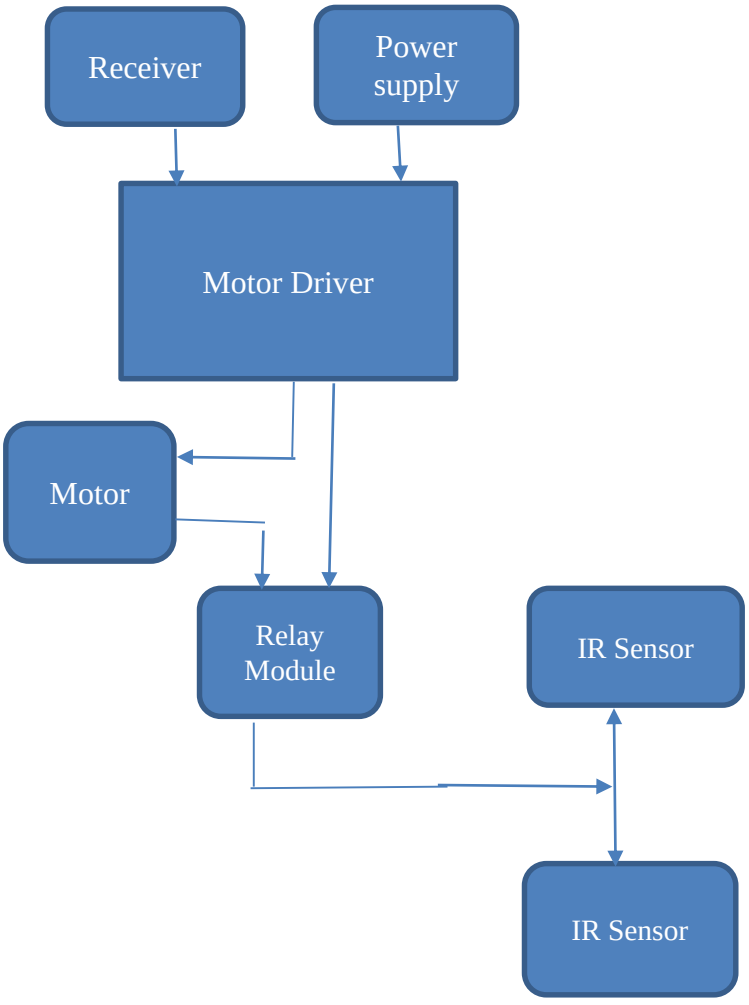

Fig.6.1. Block Diagram

The receiver system have resistor connected to the decoder which is connected to the RF receiver, that has frequency of 443hz. All this circuit is made on PCB and components are soldered to the PCB for it to stay fixed.

The motor driver is connected to main power supply which is a charger which gives 12V output and works on 65W power. One of the relay attachment is given to motor driver, the relay works as a key for both the sensors which are being placed under the platform to detect the object.

The IR sensors are placed in such a way that the object can be detected from front side as well as back side. The sensors and relay module have different 5v battery supply for it to work, since the sensor wok only on 5v supply. When the object is detected the command is given to the motor to stop then and there itself for the safety reasons, so that the person standing on platform does not get injured also the object before doesn't get any damage.

The platform in which the person is standing is attached to the timing belt, also a handle is given to the base in which the remote is attached. The remote consist of switch, Rf transmitter and encoder. All these components are connected through wire and has a battery supply. When the command is given of forward direction then the signal is being received by the receiver side, also the signal is send through the Rf transmitter. This signal is received and the motor start to rotate in forward direction and same goes for reverse direction. When the platform is not in used you can close it as well.

Chapter 7

SYSTEM COMPONENTS

30 RPM DC Motor

A DC motor is an electric motor that runs on direct current (DC) power. A DC motor rated at 30 RPM is a specific type of DC motor that is designed to rotate at a relatively low speed of 30 revolutions per minute (RPM). They are typically used in low-speed applications such as in small appliances, toys, and other low-power devices, also in robotics, conveyors and other machinery that require precise and consistent low-speed movement. They are relatively simple and easy to use, widely available in the market and are relatively low cost. They are also efficient, and can provide high power-to-weight ratios.

Fig.7.1.DC Motor

Timing pulley GT20

GT20 timing pulley is a specific type of timing pulley that is designed to be used with GT2-type timing belts, a popular choice for their high precision and smooth operation. They are widely used in 3D printers, CNC machines, and other precision machinery applications. GT20 pulleys come in different sizes, widths and bores, to fit different shaft sizes and configurations. They are made of aluminium, steel or plastic, lightweight, durable and easy to install. They are low cost and widely available in the market, making them a popular choice among hobbyists and engineers.

Fig.7.2.Timing pulley GT20

Timing belt

A timing belt is a type of belt that is used to synchronize the rotation of two or more shafts in an engine or machine. It is made of rubber or synthetic materials, and has teeth on the inside that mesh with the gears on the pulleys. This helps to keep the shafts in synchronization, ensuring that the valves and pistons in an engine move in the correct sequence. Timing belts are commonly used in automobiles, industrial equipment, and other machinery. They have to be replaced periodically, as they will wear out over time, if the timing belt breaks the engine may stall or stop running.

Fig.7.3. Timing belt

Power Supply

A power supply is a device that converts electrical energy from a source, such as an AC wall outlet, into a form that can be used by electronic devices. A 12V 1A power supply is a specific type of power supply that produces a 12-volt DC output at 1 ampere of current. It is commonly used to power electronic devices such as LED lights, small motors, and other low-power electronic devices.

The 12V output voltage of this power supply is a standard voltage used in a wide range of electronic devices. It is often used in automotive, industrial and household devices, as well as in some security systems and surveillance cameras. The 1A current rating indicates that the power supply can provide a maximum of 1 ampere of current to a load.

Fig.7.4. Power Supply

Decoder HT12D

The HT12D is a remote control decoder that receives an encoded data stream transmitted by an HT12E encoder and decodes it back into its original parallel form. It has 8 address bits and 4 data bits, which corresponds to the 8 address bits and 4 data bits of the HT12E encoder, it can decode 12 bits of parallel data. It is widely used in remote control systems for its easy to use, low cost, small size, and low power.

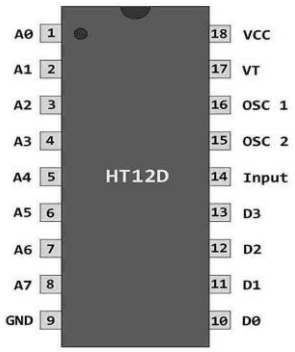

Fig.7.5.Decoder HT12D

Encoder FC HT12E

The FC HT12E is a remote control encoder that converts parallel data into a serial data stream, which is then transmitted using an RF signal to a receiver. It has 8 address bits and 4 data bits, which can encode 12 bits of parallel data. It is widely used in remote control systems for its easy to use, low cost, small size, and low power.

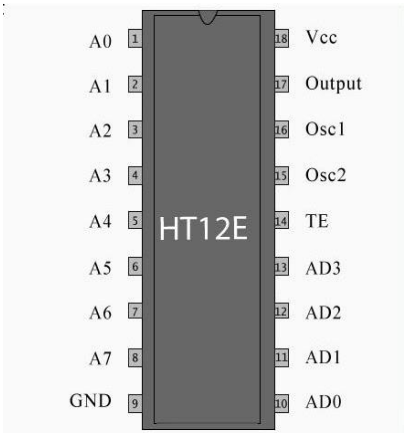

Fig.7.6.Encoder FC HT12E

L298 Motor Driver

The L298 motor driver is a type of motor controller that is used to control the speed and direction of DC motors. It is a dual full-bridge driver that can control two motors independently or simultaneously. The L298 is a popular motor driver for hobby and educational projects, as it is relatively simple to use and can be easily interfaced with microcontrollers. It has built-in protection features such as thermal shutdown and short circuit protection that helps to protect the device from damage in case of an overcurrent or overheating situation. It is a popular choice for controlling DC motors in robotics and other applications, because it provides a simple, low-cost solution for controlling the speed and direction of DC motors.

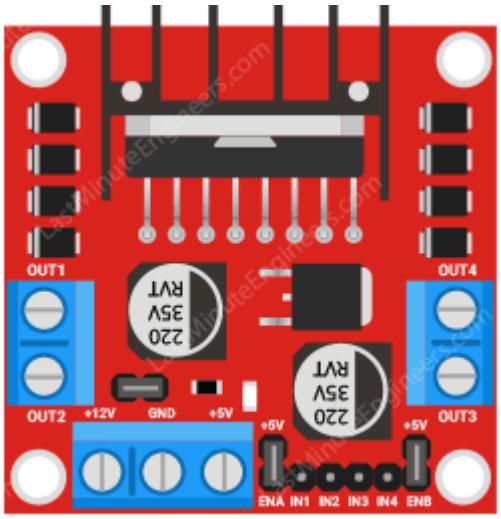

Fig.7.7. L298 Motor Driver

Push Button DPDT

A push-button DPDT (Double Pole Double Throw) switch is an electrical switch with two separate sets of contacts that change their state simultaneously when the switch is pressed. It consists of two poles, each with a common terminal and two other terminals. When the switch is pressed, it simultaneously connects the common terminal of each pole to one of the other terminals, effectively changing the circuit connections. This type of switch is commonly used in applications where two separate circuits need to be controlled or switched at the same time, such as motor control, reversing circuits, or alternate circuit selection.

Fig.7.8. Push Button DPDT

Voltage Regulator FC7805

The FC7805 is a linear voltage regulator that is designed to provide a stable 5V output voltage regardless of changes in input voltage or load conditions. It is highly efficient, with a low dropout voltage and thermal protection, making it suitable for a wide range of applications. It is a cost-effective solution for providing a stable output voltage.

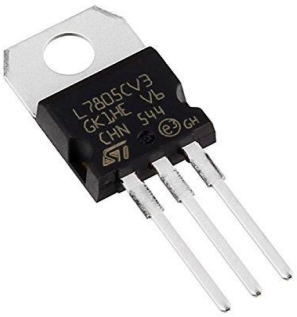

Fig.7.9.Voltage Regulator FC7805

RF Module

RF modules are widely used in various applications such as remote control, wireless data transfer, and industrial automation. They are also used in home automation and IoT devices to transmit data wirelessly. They are easy to use. With the advancements in technology, RF modules are becoming more compact, efficient, and affordable, making them even more accessible for various applications.

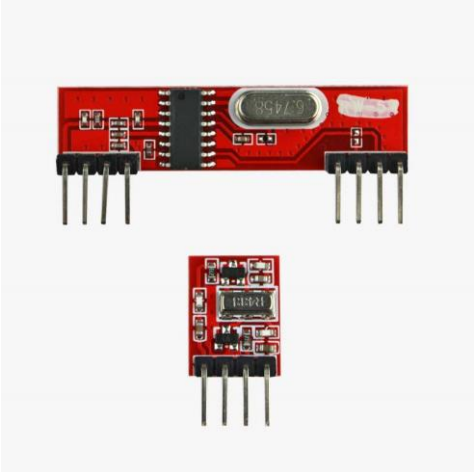

Fig.7.10. RF Module

Chapter 8

CAD Modeling

The Computer Aided Design model is made by using Soild works software. Below are the different views of the model.

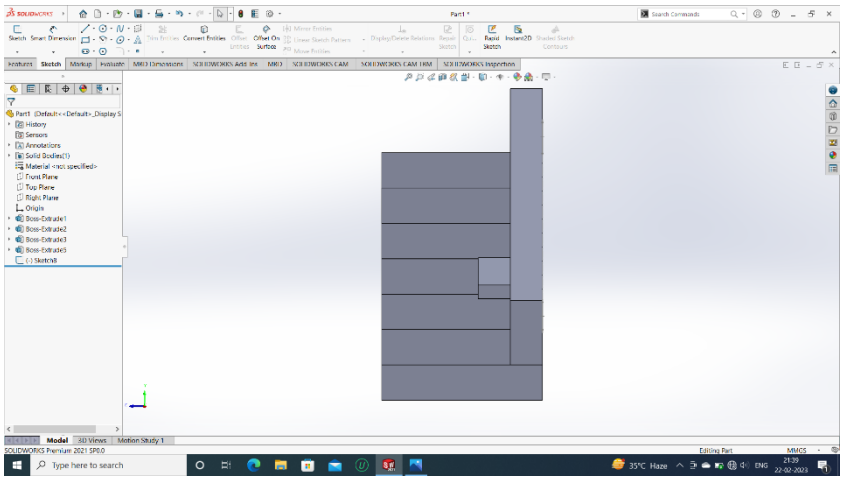

Fig.8.1.Front View of CAD Model

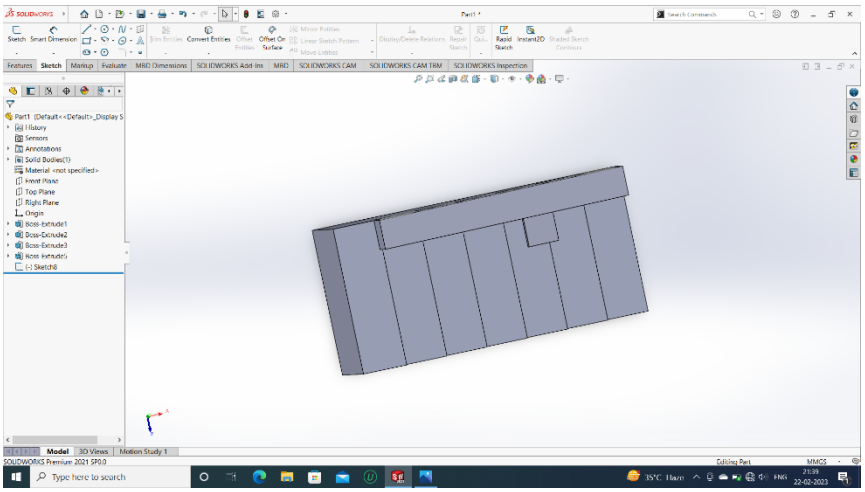

Fig.8.2.Top View of CAD Model

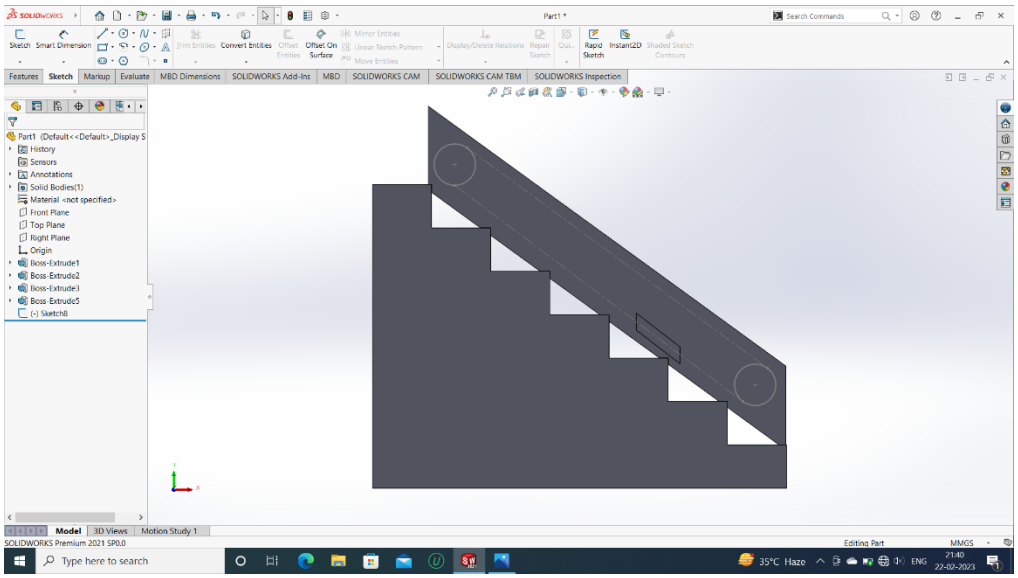

Fig.8.3. Side View of CAD Model

Chapter 9

EXPERIMENTAL SETUP

System consist of two portion mechanical and electronic system. In mechanical system, timing pulley is fitted with the motor and shaft. While the electronics system consists of sensors, motor driver, RF transmitter receiver and encoder decoder. Switch is gives signal to RF receiver, decoder detects which direction command is given forward or backward, motor moves according to the given direction and the platform moves with it. Motor driver helps to control the speed of the motor. Sensor is attached to relay and it is connected to motor. Everything is connected in series system. IR sensors detect the object and stops the motor few distance away, so for this two sensors are used in one relay. All of this has main power of 12V supply and a 5V is used for relay and sensor.

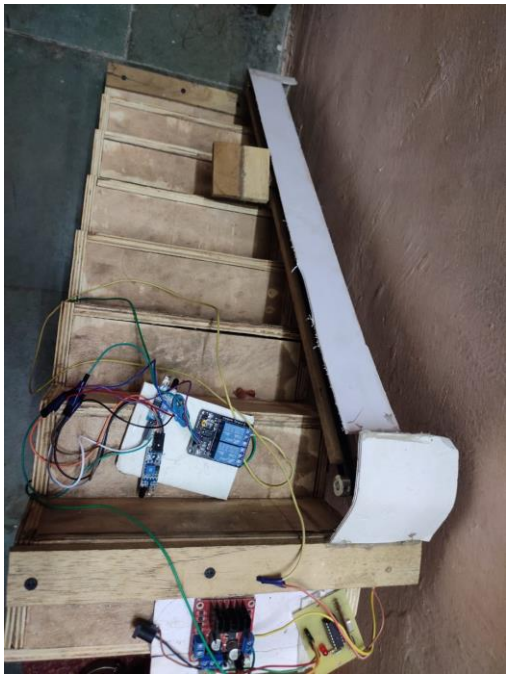

Fig.9.1. Top View Of Final Product

Fig.9.2. Side View of Final Product

Chapter 10

BENEFITS AND DEMERITS OF STEP LIFT

There are several benefits that a step lift has and which make it favorable for many users.

BENEFITS

- Step lift is perfect for the elder or disable people to use.
- Step lift is not space consuming, also it does 2 roles in one being a railing also a stair lift.
- Easy to installation.
- Object detection sensors are there so the person will not get any harm.
- Safety is more in step lift.

Demerits

- Switch board must be there for the main power supply.
- Need customization size for stair.

Chapter 11

BUDGET

Following table shows the total cost of the project.

Product	No. of component	Cost
Motor Driver	1	130
RF Module	1	110
Voltage Regulator	1	45
Push Button	2	10
Battery	2	40
Encoder HT12E	1	60
Decoder HT12D	1	60
Printed Circuit Board	1	90
Power Supply 12V	1	150
Timing Belt	1	500
Timing Pulley	2	150
DC Motor	1	100
Free Wheel	1	100
IR Sensor	2	100
Relay Module	1	100
Miscellaneous	-	600
Total Project Cost		**2345/- Rs**

Table.11.1. Total Cost of Project

Chapter 12

LIFT INSTALLTION Vs STEP LIFT INSTALLATION

	ELEVATOR INSTALLATION	STEP LIFT INSTALLATION
Civil construction	**1.5 – 2 Lakh**	**0**
Buying the Product	**2- 30 Lakh Rs**	**1 – 1.5 Lakh Rs**
Energy Cost	**26.25-37.5Rs**	**26.25-37.5Rs**
Maintenance cost	**6000- 10000 Rs**	**2000- 5000 Rs**
Total cost	**32,01,037.5 Rs**	**1,55,037.5 Rs**

Table.12.1. Lift Installation vs. Step Lift Installation

CHAPTER 13

OBSERVATION

The first problem related to the project was the base was not strong for the components , after that the circuit diagram connection were making problem, if you move the model the connection gets loose and the sensors does not work, also the sensors effectiveness needs to be adjusted for it to detect the object. All in all the main things are connection and Also battery supply. All this problem was solved by making the base of wood. Sensor screw was tighten to increase range.

CHAPTER 14

CALCULATION

Belt Speed
V= d ×Π (1)

Where:
V= Belt speed;
d= diameters of rollers; and
Π =pi

d=1cm = 10mm
V= 0.01X TI

V= 31.41 mm/s = 0.0314 m/s

Capacity is the product of speed and belt cross sectional area generally, belt capacity (kg/sec) is given as:
BC= 3.6 ×A×V× ρ (2)
A= belt sectional area (m2);
ρ = material density (kg/m3);
V= belt speed (m/s)

ρ = 0.07
Length of belt = 140 cm = 1.4m = 1400mm
A = (a+b) h
h= 62cm 0.62m
a=0.006mm 1m
A = (0.62) x (0.006 +0.010)
A = 0.01116 m²
BC 36 X 0.01116 x 0.07 × 0.0314
B.C = 8.893 0X105
B.C = 8.83X10-2

B.C = 0.0885g

The mass of material Mm (live load) per metre (kg/m) loaded on a belt conveyor is given as:

Mm = C/(3.6×V) (3)

Where:
C= Conveyor capacity;
V= belt speed.
Mm = k
C = Conveyor capacity. (8.830710 kg)
v = belt speed (0.0314 m/s)

Mm = $\frac{8.830x\ 10-5}{3.6\times0.0314}$

Mm = 7.811 × 10^{-4} kg

Power Consumption

Power Consumption = P × $\frac{t}{1000}$ **(4)**

Where:
P is power units in watts
t = time in sec

E = P × $\frac{t}{1000}$

= 3600 × $\frac{30}{1000}$

= 36 × $\frac{30}{10}$

E = 108 Joule
E = 3 × 10^{-5} Kwh

Power consume for moving from one step to another step **is 3.75 ×10^{-6} Kwh**

Torque = Force × Radius **(5)**
R= 5mm
F= 3× 10^{-5} Kwh

Torque = 3×10^{-5} × 5
Torque = 15 ×10^{-5} N/m

CHAPTER 15

RESULT

Power Consumption is **3×10^{-5} Kwh**

Power consume for moving from one step to another step **is 3.75×10^{-6} Kwh**

Torque is **15×10^{-5} N/m**

Belt Speed is **31.41 mm/s = 0.0314 m/s**

CHAPTER 16

CONCLUSION

Through this study it can be concluded that the step lift system is high levels of automation, loading efficiency, mobility, and unloading efficiency were taken into consideration when designing the step lift system. Additionally, it has a low start-up, operating, and maintenance cost and is extremely adaptable and safe.

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