“AUTOMATIC SLIDING GATE”

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ABSTRACT

Automatic gate is one of the most usefully things to use in companies, industries, colonies, collages and schools. There is some type to operate a gate such as a sliding on screw or on rack and pinion, piston operated, rotary and chain sprocket. Design is available for some type of operation and it is most costly also when installation and maintenance cost is not yet been considered. Most of the products we used in our country imported from foreign country. The objectives of this Paper are to study, analyse, and develop a new mechanism that is cheap, safe easily available and installation is simple as well. Here, different types of mechanism are used to operate gate. Those methods are finite element modelling and mechanical design concept and theories. So we have to select material, size of material and proper installation. Therefore, the durability assessment results are significant to reduce the Cost and improve the product reliability. In order to improve the designed mechanism, vibration factor are consider and more features provided.

I. INTRODUCTION

Now a day’s sliding gate is operating by hand driven gear mechanism for forward- revers the gate, and also currently operated on geared AC motor by push button switch. Its uses increased extensively around 20\textsuperscript{th} century when expensive motorised vehicles came into existence and its safety become a concern for its users. So considering this we suggesting that revers-forward sliding gate automatically by gear control. After the huge progress made in field of electrical, mechanical that touched everything of our basic necessities, sliding gate was not exception. Several sliding gate are available that can be operated with push button switch and they come with various safety measures for the users.

II. OBJECTIVES

Objectives for this project refer to the mission, purpose, or standard; minimize cost simple mechanism that can be reasonably achieved within the expected time and with the resources which are available. The objective of this project is to design an automatic gate mechanism for collage with sliding gate with weight of 400kg of the gate. Cost reduction and ease of installation are also considered for this mechanism, the main objective in this paper is to design; the control mechanism, Design of hardware to open or close gate automatically, reduced overall cost. Easy maintenance and high operating efficiency.
III. PROJECT SCOPE

The design and fabrication the mechanical part of automatic sliding gate system requires the finished gate system to operate faster. The use of light weight material is applied in order to enhance the gate system capability and performance as well as to reduce the cost of the project. The manufacturing knowledge applied is the extension of statics, dynamics, solid mechanics and manufacturing technology detailing aspects and scope designing and fabricating a gate system. Likewise, unique scope of work should be determined to achieve the purpose and goal of the project.

IV. BLOCK DIAGRAM

Fig. Block Diagram of Automatic Sliding Gate Control

The design of Semi-automated gate consists of two parts viz., Electrical design and Mechanical design. Fig represents the complete Block diagram of Semi-automated gate. It mainly consists of five modules viz., Power source, Electronic Converter, Motor and Controller. Firstly AC power is fed to the AC motors, which is responsible to move the gate in forward and reverse direction. As shown in the fig, the mechanical load consists of Gate and gear box which works on the basic principle of sprocket and chain mechanism. And Hence overall operations is been controlled by the controller.

V. COMPONENT DISCRIPITION

5.1. GEARBOX:-

A reduction drive is a mechanical device to shift rotational speed. A planetary reduction drive is a small scale version using ball bearings in an epicyclical arrangement instead of toothed gears. Reduction drives are used in engines of all kinds to increase the amount of torque per revolution of a shaft: the gearbox of any car is a ubiquitous example of a reduction drive. Worm Gearboxes is the type of gear system in which higher torque is achieved with low speed gear ratio. Being simple and compact in design, these gears can achieve higher gear
ratio than the helical gears. These worm reduction gears having screw type qualities are similar to helical gears, but its helix angle is typically comparatively larger) and its body is normally quite long in the axial direction. The gears in these gearboxes can be right or left-handed depending upon the purpose.

Fig. Gear-box

5.2. AC MOTOR:-

An AC motor is an electric motor driven by an alternating current (AC). The AC motor commonly consists of two basic parts, an outside stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft producing a second rotating magnetic field. The rotor magnetic field may be produced by permanent magnets, reluctance saliency, or DC or AC electrical windings. Less common, AC linear motors operate on similar principles as rotating motors but have their stationary and moving parts arranged in a straight line configuration, producing linear motion instead of rotation.

Fig. Ac Motor

5.3. LIMIT SWITCH

Fig. Limit Switch
They are used for controlling machinery as part of a control system, as safety interlocks, or to count objects passing a point. A limit switch is an electromechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection.

Limit switches are used in a variety of applications and environments because of their ruggedness, ease of installation, and reliability of operation

VI. METHODOLOGY

6.1. Basic Design and Working of Gate:

The main objective in this paper is to design mechanical and electrical aspects to achieve the automation of the sliding gate. In this proposed method we are using rack and pinion mechanism for sliding the gate towards forward and reverse direction.

Fig. Construction of Gate

6.2. MECHANICAL CALCULATIONS:

Coefficient of friction between rollers and track \( \mu = 0.20 \)

Mass of the gate door, \( M = 450 \text{ kg} \) (\( M = 500 \text{ kg} \), for safer operation)

Acceleration due to gravity, \( g = 9.81 \text{ m/s}^2 \)

Force, \( F = \mu \times M \times g \)
F = 0.20 × 500 × 9.81

F = 981 N -- (1)

Torque, T = F × x

Where, x is distance between chain and centre of sprocket

So, x = D/2 = 0.04 (Diameter of sprocket = 80 mm)

Now, T = 981 × 0.04

T = 39.24 Nm -- (2)

Velocity, V = Distance/time

Time, t = 30 sec

Distance, D = (17.5 ft / 3.3) = 5.3 m

V = 5.3/30 = 0.17 m/s

V = \pi DN/60

0.17 = (\pi × 5.3 × 10^{-3} × N)/60

N = 61.25 rpm -- (3)

Speed of revaluation, N = 61.25 rpm

Power required,

P = 2\pi NT/60

= (2 × \pi × 61.25 × 39.24) / 60

P = 251.68 W -- (4)

We know that, 1 HP = 746 W

So, P = 251.68/746

P = 0.33 HP

So, we select the standard motor of power P = 0.5 HP.
VII. CONCLUSION

This automatically gate is most useful and simply to operate at any condition in commercial sector, industrial sector, schools and colleges. Because of atomization no manual force requires. It also has less cost and energy required for it is very less. The design and construction minimizes the risk of operation.

VIII. ACKNOWLEDGEMENT

The automatic sliding gate should also be able to operate properly when installed on normal gate with weight of 400 kg. Fabrication of sliding automatic gate is reliable, simple to maintain and required less cost than that of the other types of automatic gates.

REFERENCES

JOURNALS

[2] Inamdar Vasim, Khaire Akshay and Mr. patait S.B., Rack and pinion operated automatic sliding gate, global journal of engineering science and researches.

BOOKS