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Design and Fabrication of Multi-stage Two Wheeler Parking System

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***Abstract**: In this paper, the basic multi-stage two wheeler parking system with two floors is considered to show the useof control systems in parking systems. The control system will play a major role in organizing the entry to and exit from the parking lots. It also presents the design of multi -stage parking lots which occupies less need on the ground and contains the large number of two wheelers. In the modern world, where parking-space has become a very big problem, it has become very important to avoid the wastage of space in modern multi-stage car parking system helps to minimize the two wheeler parking area in road sides. The parking lots have an elevator to carry two wheelers to other floors according to the vacancies. The elevator is controlled by piston and cylinder along with DC Valve and solenoid.*

Key-Words: Piston, Cylinder, Two wheeler park system, DC Valve, 1HP motor , Solenoid.

Introduction:

The advancement and progress of nations is measured by the possibility of their use and application of latest invented technologies in all aspects of life. Mechanical engineering is one of the aspects which have been given a great deal by many researchers. This paper is devoted to the use of Mechanical systems in parking systems. The mechanical system will play a major role in organizing the entry to and exit from the parking lots. It also presents the design of multi-stage parking system which occupies less need on the ground and contains the large number of two wheelers. Therefore, the need of using technologies became inevitable. In the modern world, where parking-space has become a very big problem, it has become very important to avoid the wastage of space in modern multi-stage two wheeler parking system helps to minimize the two wheeler parking areas in road sides. There are two types of two wheeler parking systems: traditional and multi-stage. In the long term, multi-stage two wheeler parking systems are likely to be more cost effective when compared to traditional parking garages. They tend to require less building volume and less ground area than a conventional facility with the same capacity. This research is devoted to the multi-stage two wheeler parking system. A multi-stage two wheeler parking is essentially a building with number of floors or layers for the two wheelers to be parked. The different stages are accessed through interior or exterior ramps. A multi-stage two wheeler parking has mechanized lifts which transport the two wheelers to the different levels at a certain position. Therefore, these two wheeler parks need less building volume and less ground space and thus save on the cost of the building. This system proves to be useful in reducing wastage of space where more than 100 two wheelers need to be parked. This system enables the parking of vehicles, floor after floor and thus reducing the space used. Here any number of two wheelers can be parked according to the requirement. These makes the systems modernized and even a space-saving one. Multi–stage two wheeler parking system is essential especially in regions facing space shortages, also in areas which cater huge crowds. Failing to accommodate the growing number of two wheelers, it has become imperative to come up with more efficient parking solutions. In this regard, multi-stage two wheeler parking is considered effective in tackling the issue of parking.

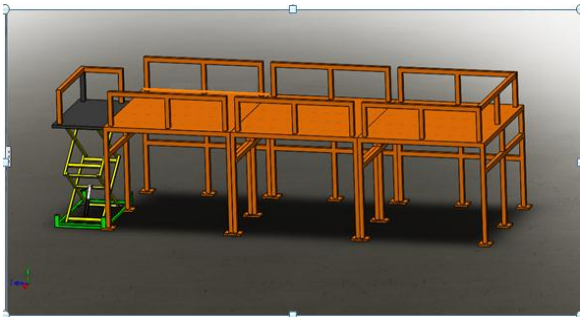
Advantages of multi-stage two wheeler park system

This system is more versatile and fast parking system. The advantages of multi-stage parking system are:

- Maximum utilization of ground space.
- Quick entry and exit due to the independent operation of lifts.
- Designed for driver convenience.
- Partial breakdown doesn't affect the other parts.
- Multiple safety guarantee of the drivers and the cars too.
- Require less building volume and less ground area.

2 Experimental Setup

In this paper, a symbolic parking system has been designed for two wheeler parking comprising desirable floors, executing the entry and exit of vehicles through elevator which is controlled by hydraulic cylinder. The layout of the multi-stage car parking system is displayed.



Multi-stage two wheeler parking system layout

Working Principle:

Process of lining up the two wheelers on all the floors begin as soon as the first two wheeler arrives near the elevator. The first two wheeler moves into the elevator along with the driver. As the two wheeler moves into the elevator, the solenoid switch near the elevator is switched ON by the driver to lift the elevator up. Then the elevator hoist up the two wheeler along with driver with the help of piston and cylinder. After reaching the first floor, the elevator stops automatically.

Construction of the system

In this project we discussed some elements that help in shaping a compact system for the two wheeler parking comprising multi floors. Keeping in view the cost of elements, easily available ones in the market were selected which contributed to the Cheep execution of the project. The elements chosen were as follows;

- Power pack
- DC Valve
- Solenoid
- Piston and Cylinder
- Mild steel
- Pin and Roller

Power Pack

A hydraulic power pack is a self-contained unit that consists mainly of a motor, a reservoir and a hydraulic pump. Using fluid to transmit power from one location to another hydraulic power packs can generate massive amounts of power which can be used to drive hydraulic machinery.

1HP motor:

These motors have been used in industrial applications for years. These motors provide very precise control. These motors can be used with conveyors, elevators, extruders, marine applications, material handling, applications. These motors are the electrical devices with output power around 1HP (Horse power). These are mostly single phase induction motors. It plays a vital role in domestic applications. When supplying a single phase voltage to the stator of these machines, the stator will produce flux. This flux rotates and cuts the rotor conductors. Due to this an EMF is induced. As the rotor circuit is closed the current flows through the rotor conductor. This rotor current will cause rotor flux. These rotor fluxes also rotate in opposite direction as the stator flux. The interaction of these two fluxes leads to a resultant torque which rotates the motor.

Specification:
Pole:4
Speed:1440rpm
Type: Electric induction Motor
Output power:1HP
Volt:230V

Features:

- Lightweight
- Longer service life
- Excellent performance

Solenoid:

Solenoid is the generic term for a coil of wire **used as** an electromagnet. It also refers to any device that converts electrical energy to mechanical energy using a **solenoid**. The device creates a magnetic field from electric current and **uses** the magnetic field to create linear motion.

Features:

Item	**Specifications**
Operating system	Pilot type
Effective cross section(CV Value)	1.2mm^2
Lubrication	Not required
Operating pressure resistance	0.2 to 0.7 MPa

Directional Control Valves

(DCVs) are one of the most fundamental parts of hydraulic and pneumatic systems. DCVs allow fluid flow (hydraulic oil, water or air) into different paths from one or more sources. DCVs will usually consist of a spool inside a cylinder which is mechanically or electrically actuated. The position of the spool restricts or permits flow, thus it controls the fluid flow. A hydraulically operated Directional control valve works at much higher pressures than its pneumatic equivalent. They must therefore be far more robust in nature so are precision machined from higher quality and strength materials.

Calculation for cylinder:

Design for load to be lifted:

Load =Area*Pressure

Diameter of cylinder D=72 mm

D=7.2cm

Therefore, area of a cylinder;

$A=\pi/4\ (D)^2$

$A=\pi/4\ (7.2)^2$

$A=40.7 cm^2$

Calculation for pressure:

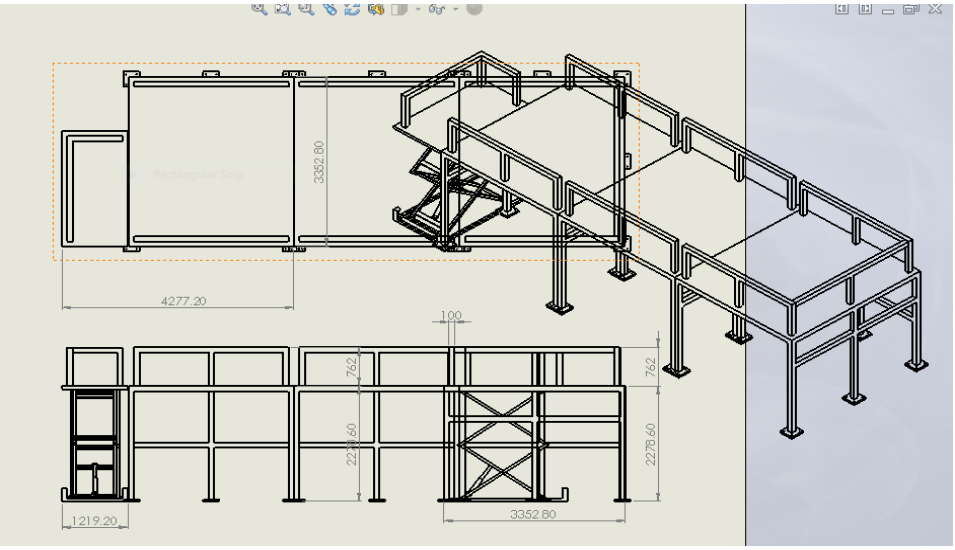
$p=120 kg/cm^2$

Therefore, load P=area*pressure(p)

P=40.7*120

P=4885.8N

Specifications of Lift



Two dimensional view with dimension

1. **Plate:**

Length=2285mm
Breadth=1220mm
Total weight of the plate =36kg
Total weight of the lift=225k
Max.load=400kg

2.Piston and cylinder:

Inner Dia=63mm
Outer Dia=73mm
stroke=600mm

3.Oil tank:

Tank capacity =20L
Oil type:68G oil

4.Pin and Roller:

No. of pins=16
Size of pin=20mm dia(MS polished rod)
No. of roller=4,
size=60mm dia

Conclusion:

The multi-stage two wheeler parking system had successfully been designed and developed. It can be noticed that the system for the multi-stage two wheeler parking system has achieved the anticipated performance to regulate the entry and exit of the two wheeler to/from multi floors accurately. The movement of the elevator between the floors was continuous and smooth as requested. The entry and exist phases of the two wheelers depends on the availability of the elevator and the time required for exist. The preference for the entry will be for the two wheeler that is present at the stopping in front of an elevator at the ground floor. Meanwhile, the preference for exist from other floors will depend firstly on the space and secondly on the time demanded for exist.

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