Development of 90 Degree Steering Mechanism for Four Wheeler

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Abstract— In this project we are fabricate the four wheel drive with 90 degree rotation. This is a new innovative concept. Here we are doing the equipment by the following arrangements with motor, chain drive, keypad, vehicle model, battery and control unit. This concept is very useful to reduce the parking time in shopping complex, hotels, etc.

Keywords: 90 Degree Steering Mechanism for Four Wheeler

I. INTRODUCTION

90 degree steering mechanism basically helps to reduce the efforts and space required for a person to steer his vehicle. Most of us can't even imagine what life would be like with disability. We take walking, running, driving a car for granted, but for those who spend much of their day in wheel chair, these things are a challenge. Although accessibility has improved drastically over the past few decades, many things especially vehicles aren't just designed with disabled person in mind. This 90 degree mechanism can be implemented in vehicles that can be designed especially for the disabled, for whom, simple vehicle designs are necessary. In the current scenario, the vehicles that the disabled use are simply the same ones that normal people use, with some basic attachments such as side wheel attachments used in scooters. The major problems in these systems are

- Large turning radius
- Large effort
- Not eco friendly

Now the project mainly concentrates on designing a suitable operating system. To maintain simplicity and economy in the design the locally fabricated unit has been used.

Our project achieves higher safety, reduces human effort, increases the efficiency, reduces the work load, reduces the fatigue of workers and reduces maintenance cost.

II. OBJECTIVES

- To understand the basic principal of the our project
- Describe the construction and working of various parts of our project
- Development of the working model of the our project

The aim is development of the specifications of the original 90 degree turning wheels for transverse parking project are outlined in this chapter. The development of suitable goals and specifications were crucial to the project's success as they guided both the design and aims of the project team. As part of the requirements of the project a number of goals were established to measure the success of the project. The primary goals were defined as the goals the group hoped to achieve a minimum for success. The main objectives of the project are:

- Better parking at home in narrow space and at multiplexes
- This type of car can be taken through traffic jam
- Car can be move easily
- Use of electrical drives to optimize power consumption.
- Maintenance is low

III. CONSTRUCTION

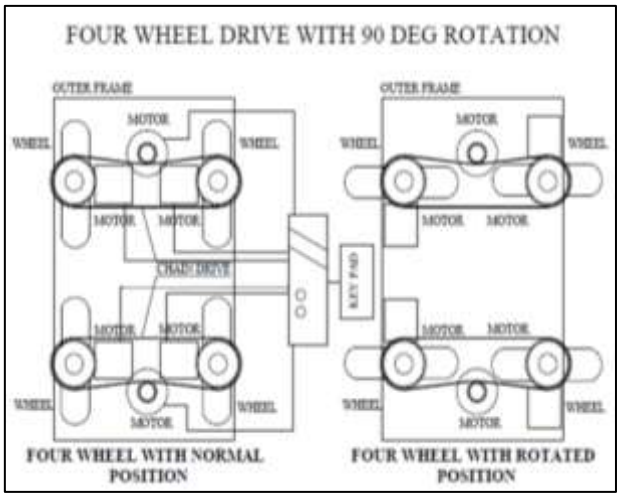


Fig. 1:

IV. WORKING

In this project battery provides the power supply to the control unit. The equipment contains totally six motors, two motors are coupled with the vehicle's left and right wheels of the front side, the next two motors are connected to the vehicle's left and right side of the back side. The four motors are used to run the vehicle. Another two motors are connected to rotate the vehicle wheel 90 degree by the chain drive arrangements. The keypad in the control unit has six keys they are left, right, forward, reverse, park left, and park right. We press the left key in the keypad the vehicle turns left side in a required angle, we press the right key in the keypad the vehicle turns at right side in a required angle, similarly the forward and reverse motion of the vehicle are controlled by the forward and reverse key in the keypad. We want to park the vehicle in left side by press the park left key then the motor connected in the chain drive is turns the wheel left side 90 degree automatically, then the vehicle is parked in the left side, this process is same as right side. Using this we can easily park the vehicle in various areas.

V. DESIGN AND DESIGN CONSIDERATION OF PROJECT

A. Introduction:

Project design may be defined as the iterative decision making activity to create a plan or plans by which the available resources are converted, preferably optimally, into systems, processes or devices to perform the desired functions and to meet human needs. In fact project design has been defined in many ways but the simplest ways to define project design as

"An iterative decision making process to conceive and implement optimum systems to solve society's problems and needs."

Project design is practical in nature and must be concerned with physical reliability, or economic and financial feasibility Design is essentially a decision-making process. If we have a problem, we need to design a solution. In other words, to design is to formulate a plan to satisfy a particular need and to create something with a physical reality.

B. Basic concept of project design:

Decision making comes in every stage of design. Consider two cars of different makes. They may both be reasonable cars and serve the same purpose but the designs are different. The designers consider different factors and come to certain conclusions leading to an optimum design. Market survey gives an indication of what people want. Existing norms play an important role. Once a critical decision is made, the rest of the design features follow. For example, once we decide the engine capacity, the shape and size, then the subsequent course of the design would follow. A bad decision leads to a bad design and a bad product.

Design may be for different products and with the present specialization and knowledge bank, we have a long list of design disciplines e.g. ship design, building design, process design, bridge design, clothing or fashion design and so

C. Types of project design:

There may be several types of design such as

1) Adaptive Design

This is based on existing design, for example, standard products or systems adopted for a new application. Conveyor belts, control system of projects and mechanisms or haulage systems are some of the examples where existing design systems are adapted for a particular use.

2) Developmental Designs

Here we start with an existing design but finally a modified design is obtained. A new model of a car is a typical example of a developmental design.

3) New Design

This type of design is an entirely new one but based on existing scientific principles. No scientific invention is involved but requires creative thinking to solve a problem. Examples of this type of design may include designing a small vehicle for transportation of men and material on board a ship or in a desert. Some research activity may be necessary.

Types of design based on methods

4) Rational Design

This is based on determining the stresses and strains of components and thereby deciding their dimensions.

5) Empirical Design

This is based on empirical formulae which in turn are based on experience and experiments. For example, when we tighten a nut on a bolt the force exerted or the stresses induced cannot be determined exactly but experience shows that the tightening force may be given by P=284d where, d is the bolt diameter in mm and P is the applied force in kg. There is no mathematical backing of this equation but it is based on observations and experience.

6) Industrial Design

These are based on industrial considerations and norms viz. market survey, external look, production facilities, low cost, use of existing standard products.

D. Factors to be considered in Project Design

There are many factors to be considered while attacking a design problem. In many cases these are a common sense approach to solving a problem. Some of these factors are as follows:

1) What device or mechanism to be used? This would decide the relative arrangement of the constituent elements.
2) Material
3) Forces on the elements
4) Size, shape and space requirements. The final weight of the product is also a major concern.
5) The method of manufacturing the components and their assembly.
6) How will it operate?
7) Reliability and safety aspects
8) Inspectibility
9) Maintenance, cost and aesthetics of the designed product.

– What device or mechanism to be used:

This is best judged by understanding the problem thoroughly. Sometimes a particular function can be achieved by a number of means or by using different mechanisms and the designer has to decide which one is most effective under the circumstances. A rough design or layout diagram may be made to crystallize the thoughts regarding the relative arrangement of the elements.

1) Material:

This is a very important aspect of any design. A wrong choice of material may lead to failure, over or undersized product or expensive items. The choice of materials is thus dependent on suitable properties of the material for each component, their suitability of fabrication or manufacture and the cost.

2) Load:

The external loads cause internal stresses in the elements and these stresses must be determined accurately since these will be used in determining the component size. Loading may be due to:

1) Energy transmission by a project member.
2) Dead weight.
3) Inertial forces.
4) Thermal effects.
5) Frictional forces.

E. Steps in project design

Project Design or mechanical design is primarily concerned with the systems by which the energy is converted into useful mechanical forms and of mechanisms required to convert the output of the project to the desired form. The design may lead to an entirely new project or an improvement on an existing one. Thus project design is the production or creation of the right combination of correctly proportioned moving and stationary components so constructed and joined as to enable the liberation, transformation, and utilization of energy.

The basic procedure of project design (Mechanical Project Design) consists of a step by step approach from given specifications of functional requirement of a product to the complete description in the form of blue prints of the final product. The following steps are involved:

1) First Step:

In the very first step a complete list of specifications for the functional requirement of the product is to be prepared. The requirement may include, for example:

1) Output capacity;
2) Service life;
3) Cost;
4) Reliability; etc.

In consumer products, in addition appearance, noiseless operation, and simplicity in control are important requirements. Depending upon the type of product, various requirements are given Weight age and a priority list of specifications is prepared.

2) Second Step:

After a careful study of the requirements the designer prepares rough sketches of different possible mechanisms of project and depending upon the cost competitiveness, availability of raw material, and manufacturing facilities, the possible mechanisms are compared with each other and the designer selects the best possible mechanism for the product

3) Third Step:

In the third step of the design procedure a block diagram is to be prepared which showing the general layout of the selected configuration. In this step designer specifies the joining methods, such as riveting, bolting, and welding to connect the individual components. Rough sketches of shapes of individual parts are prepared.

4) Fourth Step:

- After selecting the required or deciding the configuration of mechanism / project in third step above. The design of individual components of the selected configuration is to be done in this step. It consists of the following stages:
- Determine the forces acting on each component;
- Selecting the proper material for the component depending upon the functional requirement, such as strength, wear, rigidity, hardness and bearing properties etc.
- Determine the likely mode of failure & select the criterion of failure like, yield strength, ultimate strength, deflection etc.
- Determine the geometric dimensions of the components using suitable factor of safety and modify the dimensions from manufacturing considerations. This stage involves the detailed stress analysis.

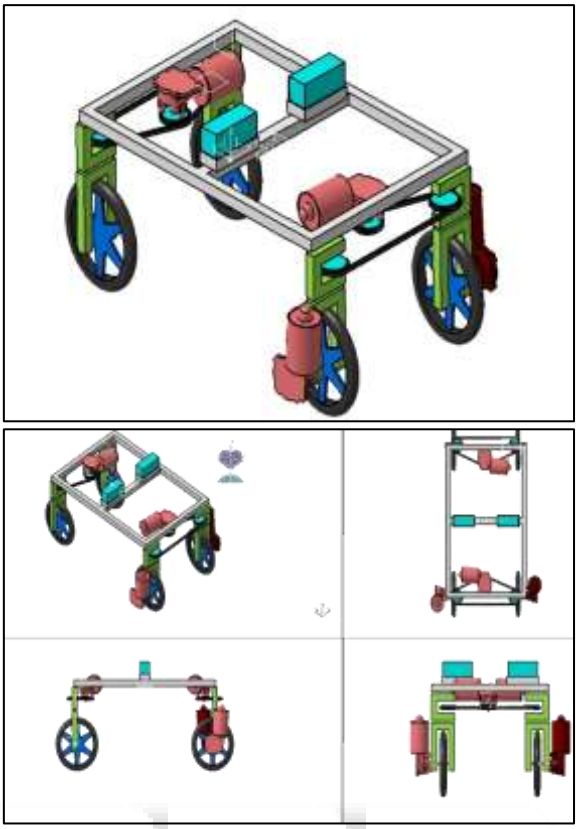
5) Fifth Step:

The last stage in design process is to prepare the blue prints of assembly and individual component. On these drawings, the material of the components, dimensions and tolerances, surface finish and machining methods are specified.

The designer prepare two separate lists of components

- Standard components to be purchased directly from the market;
- Special components to be projects in the factory;
- Thus the project design or mechanical design process is a systematic step-by-step approach from known specification to unknown solution

VI. DESIGN OF EQUIPMENT



VII. ADVANTAGES

1) No conventional grid electricity required
2) Long operating life
3) Highly reliable and durable
4) Easy to operate and maintain
5) Eco-friendly

VIII. DISADVANTAGES

1) High installation cost
2) Operating speed is low
3) Maintenance cost high
4) Operating cost is high
5) Skilled operator required

IX. APPLICATION

1) Industrial purpose
2) Agriculturaial purpose
3) Domestic purpose
4) Commercial purpose
5) Automobile application
6) Natural person

X. FUTURE SCOPE

The problem for the project was to design a car which steers through 90 degrees. 90 degree steering mechanism basically helps to reduce the efforts and space required for a person to steer his vehicle. The 90 degree steering mechanism is established using rack and pinion mechanism which is feasible to manufacture, easy to set up, and highly efficient in attaining counter-phase.

XI. CONCLUSION

Our project is successfully implemented for a new absolute eco-friendly vehicle with independent, low emission transportation by using electric motors of proper specifications possible for people who utilize wheel chair is designed, with a rear entry facility. Components used in this system are easy to manufacture, material used is feasible, reliable and easily available in market. The main disadvantage of this system is that it can run only at a maximum speed of 35Km/h. An advanced system of solar cells can be used on the roof of the car thereby making the system partially recharging.

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