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Design and Analysis of Rockers Bogie

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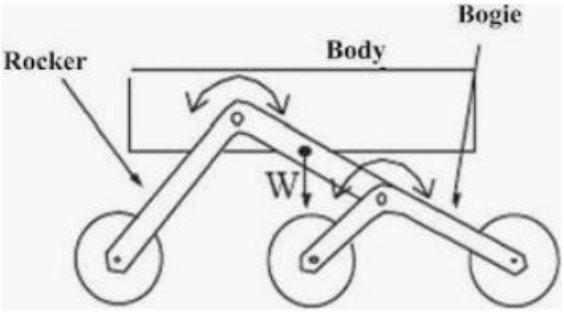
Abstract: *The Rocker-Bogie Mobility system was created with slow speeds in mind. It has the ability to overcome hurdles. When passing over a large impediment, however, the car basically stops going while the front wheel climbs the obstacle. Dynamic shocks are reduced when operating at low speeds. The front wheels are driven against the impediment by the rear wheels in order to go over it. The front of the car is lifted up and over the obstruction as the front wheel rotates. The middle wheel is then forced up against the impediment by the rear wheel and hauled up and over by the front wheel. Finally, the front two wheels drag the rear wheel over the obstruction. The vehicle's forward progress is slowed or stopped during each wheel's traverse of the impediment. The goal of using this mechanism is to reduce energy consumption by shifting the bogie's centre of mass vertically. The major goal of this project is to testify whether the how the rockers bogie impliment this mechanism on analysis software*

Keywords: Rocker-Bogie, impediment

I. INTRODUCTION

NASA has lately begun an ambitious mars exploration mission. Pathfinder is the program's initial over explorer. Future rovers will have to traverse several kilometres and modify rock and soil samples over months.As these rockers are connected to each other and the vehicle chassis by a modified differential, the name "rocker" denotes the rocking aspect of the bigger links present on each side of the suspension system and balance the bogie. The term "bogie" refers to the connecting links in the system that have a driving wheel at each end. Bogies were frequently employed as idlers on army tank tracks, dispersing the load over the terrain. Bogies were also extensively utilised on semitrailer truck trailers at the time, as the vehicles would be carrying much bigger loads.



II. LITERATURE REVIEW

The term "rocker" refers to the way the bigger links on each side of the suspension system rock. A differential connects these rockers to each other and the car chassis. When one rocker rises, the other falls in relation to the chassis. Both rockers' average pitch angle is maintained by the chassis. A drive wheel is mounted on one end of a rocker, while the other end is pivoting to a bogie. The links with a drive wheel at either end are referred to as "bogies." Bogies were frequently employed as load wheels in army tank tracks as idlers, dispersing the load throughout the ground. Bogies were also regularly seen on semitrailer truck trailers. Trailing arm suspensions are now preferred in both applications The rocker-bogie design eliminates the need for springs or stub axles in each wheel, allowing the rover to climb over obstacles twice the diameter of the wheel while retaining all six wheels on the ground. The tilt stability of any

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suspension system is limited by the height of the centre of gravity. As the loaded side yields, systems with springs tend to tip more easily.

Rocker Bogie Suspension has the unique capacity to climb over obstacles twice the diameter of the wheel without jeopardising the rover's overall stability. Some elements distinguish it as a genuine design.

The design incorporates independent motors for each wheel. There are no springs or axles, making the design simpler and more reliable The mechanism allows the vehicle to climb over high barriers while maintaining touch with the ground on all six wheels. This is only true at rovers like Curiosity's working velocity of roughly 10 cm/s.

III. METHODOLOGY

Step 1: We have started the work of our project with literature review. After referring several papers, we got many ideas. From these ideas we got the topic.

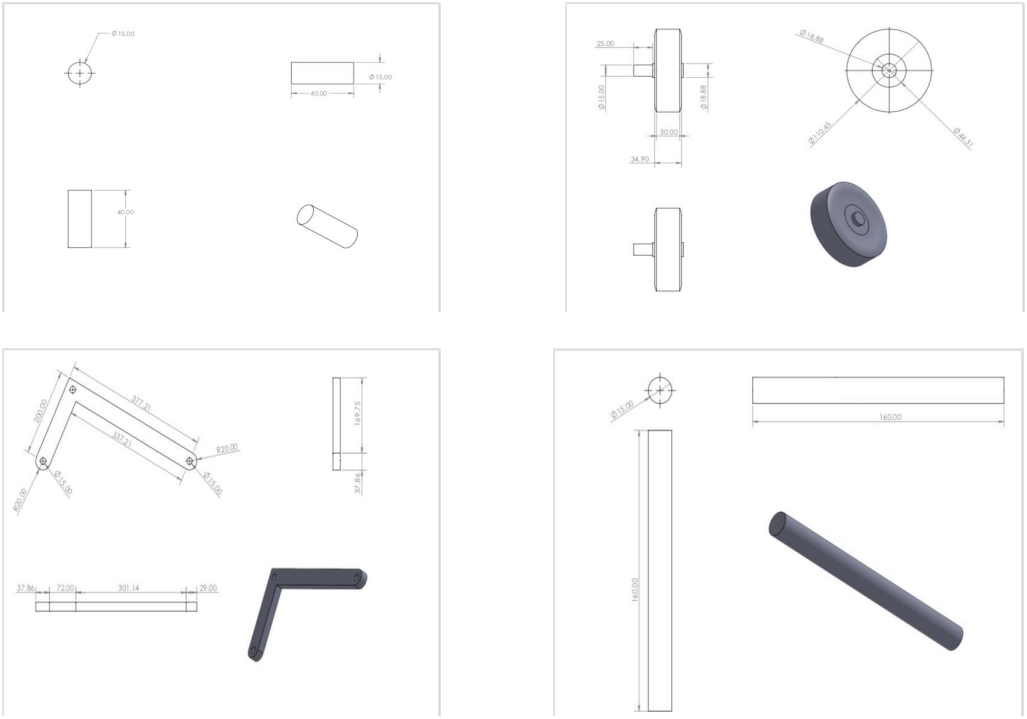
Step 2: After that the components which are required for our project are decided.

Step 3: After doing rough design we will start calculation of different parts. Once the calculation is completed, we have drawn a 3D model in Auto CAD.

Step 4: : By referring this 3D model we will buy the standard component required for the projects. After this we will start manufacturing work in workshop. By taking proper dimensions we will manufacture components one by one. Along with this electronics part will also be done. In electronics we will have to build controller circuit to get signal from pressure and make to make solenoid valve work. After this, assembly of different components will be done. Later testing will be started for getting various results. Simultaneously rough draft of report will be prepared. After completing testing work fair report will be done and submit

Calculations of Components:

Fisrt we have drawn a simple free hand drawing of all components then drafted those components on software



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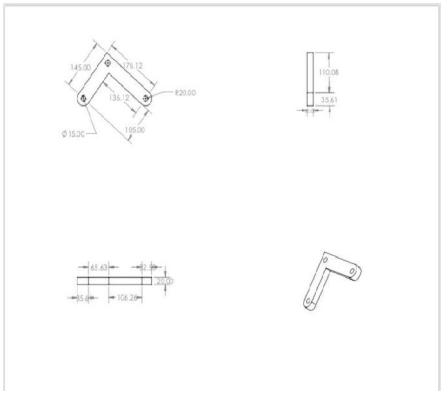
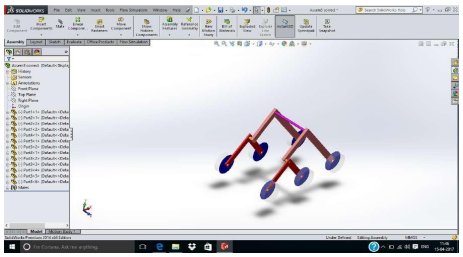


All above are the drafted models of components

1. Drafted model f pivot joint
2 Drafted model of wheels
3. Drafted model of bogie
4. Drafted model of diffential
5. Drafted model of rockers

CAD MODEL:

Now, using all of the components that were drawn at an earlier stage, we will assemble the ROCKERS-BOGIE using **SOLID WORKS** software



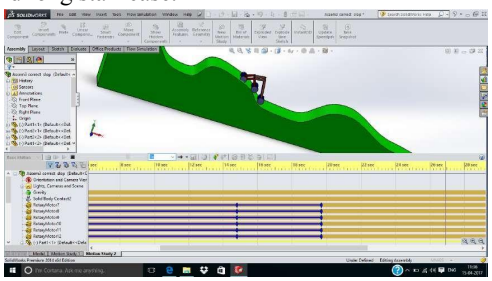
Model of RBM

SIMULATION OF ROCKERS BOGIE:

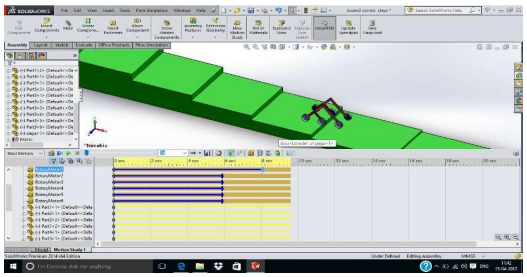
While assembling we used two types of support between component

1. Fixed support
2. Hinge support

For the assembly between wheels and bogie we have used hinge support for rotational motion of wheels. Then we have given motion to the wheels i.e 400 rpm velocity. After that we have checked the motion of rockers bogie on rough terrain and long stair case.



Simulation of Rockers Bogie on a sloped curve path



Rockers Bogie climbing on large steps

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OBJECTIVE

1. To develop an all-terrain suspension robot.
2. To avoid the use of suspension spring

IV. ADAVANTAGES

1. The design incorporates independent motors for each wheel. There are no springs or axles, making the design simpler and more reliable
2. Rocker Bogie Suspension can withstand a tilt of at least 50° in any direction without overturning, which is the biggest advantage of heavy loaded vehicle.
3. It can move in harsh environment
4. It can work in place which are beyond human reach

V. SCOPE

1. It's future application will be assist astronauts during space operations, it will act as a path finder too.
2. It can be usefull in space missions, recently it is used in mars rover. This mechanism takes consideration on unevenness of the surface it is driving on.
3. This rover has larger wheels as compared to obstacles. It can easily operate over most of the martian rocks.
4. It is also used in coal mines,actact as a spy robot and in military operations too.

VI. CONCLUSION

The circumstance presented two options of operation, one of which is a rocker-bogie system with robust obstacles traversing features, and the other of which is an enlarged support hexagon obtained by rotating the bogies on each side of the vehicle. When high-speed traversal is necessary, the suggested research develops a revolutionary design to increase the rocker-bogie mobility system in typical heavy-load vehicle behaviour.

After the realized simulation, the results has been generated and analyzed that the simulated model can run on a plane without any inclination with 10 cm/s. RBM can move on a curved path with slope. RBM can climb on steps having less height but there is a difficulty to climb on large height steps.

To our limited understanding, this initiative has provided us with wonderful possibilities and experience. While working on this project, we received a lot of practical experience in terms of planning, assembling, and machining. This project, we feel, is the finest way to bridge the gap between institutions and industries.

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