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HORIZONTAL SUSPENSION SYSTEM

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Abstract - *Vehicle is a more important part of our life, without a vehicle we can't go outside nowadays. Suspension system refers to the group of mechanical components that has the contact of vehicle to the body. Suspension system is implemented in vehicle for improving the passenger's safety and comfort.*

Most of the vehicles uses the vertical suspension system which gives good comfort but for some vehicles the horizontal suspension system can be implemented.by using horizontal suspension system most of the vibrations can be absorbed while applying break.

Key Words **vertical, horizontal, suspension, vibration, comfort.**

1. INTRODUCTION

The suspension system is an important system in automobiles consisting a group of mechanical parts connecting the frame or body. The suspension system has been discovered because of the hard struggle of engineers for making a good comfort and less vibration. In olden days the suspension system was too large and they were in front of the cars and looking so terrifically. In the front the suspension was not given to the wheels first then later on the suspension was given to the wheels with the help of springs. The wheels were holding the springs perpendicular to the road and this was effective were these springs were given to the dampers shock absorber and so on. The same type of suspension system were used in many cars, trucks and etc. In this paper we can discuss the vertical suspension system, parts, working, etc.

1.1 INTRODUCTION OF HORIZONTAL SUSPENSION

Before you begin to format your paper, first write and save the content as a separate text file. Keep your text and graphic files separate until after the text has been formatted and styled. Do not use h A horizontally mounted vehicle suspension system is provided. The suspension system contains at least one horizontally mounted shock, which provides for a more comfortable ride within the vehicle. The configuration increases the space to accommodate for the shock or shock strut, as well as allows for the use of full travel shocks in small spaces. The full shock length, with all associated benefits can be used within a smaller space. The suspension system may be used with traditional shock absorbers or shock struts.

2. MATERIALS AND METHODS

2.1 TYPES OF SUSPENSION

- DEPENDENT
- HOTCHKISS DRIVE
- SEMI-DEPENDENT SUSPENSION
    - **fig 2.2** shows the SEMI-DEPENDENT SUSPENSION.
    - A compliant link is used instead of rigid connection between the connections of wheels.
    - The beam provides the positional control of the wheels through beams also the compliance.
    - Simple in construction.
    - Wheel camber is same as body roll

INDEPENDENT

- Wheel pair has independent motion, hence the disturbance at one wheel has no impact on the other.
- Smooth ride and good handling

3. WORKING PRINCIPLE

The suspension system components includes spring and related parts that support the weight of the vehicle body on the axles and wheels shown in the **fig 7.1**. In the suspension system ideal spring absorbs road shock rapidly and then return to its original position slowly this difficult to attain. However, a very flexible or soft spring allows too much movement. A stiff or hard spring gives too rough ride. So to obtain a satisfactory ride in our suspension system we have chosen medium shock spring which prevent over ride and prevents the spring from failure. These springs were placed

at upper and lower end of damper. Initially wheel is connected with A-arm and A-arm is interconnected with Y lever arm. Which gets actuated while vehicle in motion. Other end of Y lever arm connected with dampers. In dampers new technique is introduced in which it provides damping effect as well as transmits motion means of sliding inside the Damper arrangement. In between the dampers compressed air is filled in order to provide smooth motion transmission & provide good Damping effect. In Other end of damper is connected to Y lever arm. Upper end and Lower end portion of damper springs .provided in order to control the motion of Y lever arm while vehicle in motion and provides good cushioning effect which improves the stability of vehicle in various conditions.

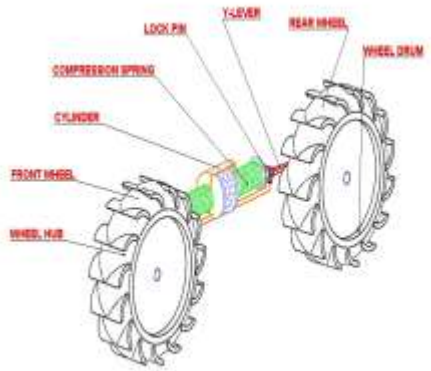
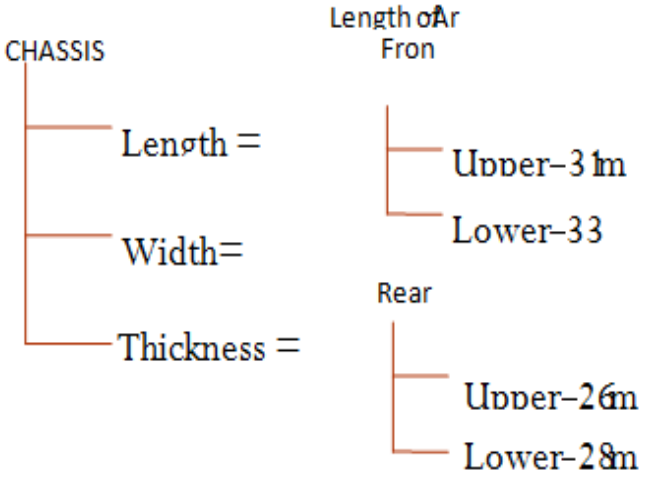


Fig 3.1

3.2 DESIGN PARAMETERS



3.3 PROPERTIES OF

Nominal thickness/dia in mm	Tensile strength kgf/mm²	Yield strength kgr/mm²	Percentage of elongation %
6≤≤20	42-54	26.0	23
20≤≤40	42-54	24.0	23
40≤x	42-54	23.0	23

CHEMICAL COMPOSITION

ELEMENT	CONTENT
Carbon,	0.1-0.2
Iron,	98.899.2
Manganese.	0.60.9
Phosphorou	≤
Sulfur	≤

3.4 MECHANICAL

Mechanical properties	Metric	Imperial
Hardness ,Brinell	126	126
Hardness, rockwell Brinell hardness	71	71
Hardness ,vickers	131	131

CYLINDER

Design of Piston rod:

Load due to air Pressure.

Diameter of the Piston (d) = 35 mm

Pressure acting (p) = 6 kgf/cm²

Material used for rod = C 45

Yield stress (σy) = 36 kgf/mm²

Assuming factor of safety = 2

Force acting on the rod (P) = Pressure x Area

= p x (Πd^2 / 4) = 6 x {(Π x 3.5^2) /4} =57.73kgf

Design of cylinder thickness:

Material used = Cast iron

Assuming internal diameter of the cylinder = 35 mm

Ultimate tensile stress = 250 N/mm^2 = 2500 gf/mm^2

Working Stress = Ultimate tensile stress / factor of safety

Assuming factor of safety = 4

Working stress (ft) = 2500 / 4 = 625 Kgf/cm^2

Length of piston rod:

Approach stroke = 50 mm

Length of threads = 2 x 20 = 40mm

Extra length due to front cover = 12 mm

Extra length of accommodate head = 20 mm

Total length of the piston rod = 50 + 40 + 12 + 20 = 122 mm

TABLE 1: LIST OF MATERIALS

SL.NO	PARTS	QTY	MATERIALS
1	Chassis	1	M.S
2	A-Arm	4	M.S
3	Y-Arm	4	M.S
4	Damping unit	2	C.I
5	Spring	4	Music wire
6	Wheel	4	_
7	Fasteners	few	C.I

TABLE 2: COST ESTIMATION

MATERIAL COST

SI.No	PARTS	QTY	AMOUNT
1	Damping unit	2	2000
2	Spring	4	750
3	A-Arm	4	500
4	Y-Arm	4	500
5	Wheel	4	1000
6	Chassis	1	1000
7	Fasteners	Few	250
TOTAL		**6000**	

LABOUR COST

The cost for the lathe, Drilling, Power hacksaw and gas cutting is 2000 RS

OVERHEAD CHARGES

The overhead charges are driven by the manufacturing cost and the manufacturing cost is calculated through

Manufacturing cost = labor cost + material cost

=6000 + 2000

= Rs.8000

The overhead charges can be calculated through the formula;

Overhead charges = 20% of manufacturing cost

=1600

TOTAL COST

Therefore the total cost is equal to ;

Total cost = material cost + labor cost + overhead charges

= 6000 + 2000 + 1600

= Rs. 9600

Total cost = Rs.9600/-

4. CONCLUSION

With this project, we understood the whole product development process first hand. Starting from the problem identification and current system study, understanding the requirements of a suspension system and its attributes, to coming up with an idea and implementing and testing the design. This project work has provided us an excellent opportunity and experience, to use our knowledge. We gained a lot of practical knowledge regarding planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gaps between institution and industries. We are proud that we have completed the work within the limited time successfully.

ASSEMBLY MODEL

DAMPER UNIT

REFERENCES

[1] William F. Milliken and Douglas L. Milliken, “Race Car Vehicle Dynamics”, SAE-International, 1995.

[2] John Crawford, “Finite Element Analysis of a NASCARWinston Cup Stock Car” Detroit, MI, December1994

[3] Bapat, C.N., "The general motion of an inclined impact damper with friction," Journal of sound and Vibration, 1995

[4] Cuvalci, O. Ertas A., "Pendulum as vibration absorber for flexible structures: Experiments and theory," Journal of Vibration and Acoustics-Transactions of the ASME, 1996..

[5] Shimoda, Toshihide Shibuya and Hirofumi Miwa. “Development of kinematical analysis method for vehicle”. Nomatsu technical, 2004

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