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STUDY OF AN ADVANCED VEHICLE IMPACT ABSORBING BODY FRAME

Abhikash[1], Aniket Vij[2], Chirag Gupta[3], Roushan Kumar[4], Mayank Gupta[5], Ravinder Tonk[6]

[1.2.3.4.5,6]Department of Mechanical Engineering, Chandigarh University, Gharuan, District Mohali, Punjab, India

ABSTRACT

The present paper relates to a Vehicle body frame that is Impact Absorbing frame. Comprising a impact absorbing body which has a compact structure made up of the strongest and the lightest material.As in normal bodies and frames there is no such protection that we are going to give or going to provide and the impact of the another striking vehicle will be absorbed. Suppose a vehicle is coming towards your vehicle and it loses control and strikes with your vehicle then the impact absorbing frame will absorb the impact and pushes the vehicle body back to resist the impact and the passengers will not get injured by the body of their own vehicle. The current study is concerned with an Impact Absorbing Vehicle Body Frame. It may be composed of a shock-absorbing body with a compact structure constructed of the strongest and lightest materials available. As with typical bodies and frames, we will not provide or provide any such protection, and the impact of another striking vehicle will be absorbed. If a vehicle approaches your car and loses control and collides with it, the impact absorbing frame absorbs the impact and pushes the vehicle body back to resist the impact, ensuring that the passengers are not wounded by their own vehicle's body. The problem with the current study in terms of passenger safety is that it causes leg injuries because when a heavy accident occurs, the impact of another car and the impact of the car's engine causes body breakage, which directly affects the legs of the passengers and the driver, causing injury and possibly fatal consequences. To address this, we created an impact absorbing frame. Other stronger materials, such as carbon fibre, are employed in today's world, but they only have the ability to withstand impact for themselves, not the vehicle body or passengers, and they may not be breakable.

Keywords: Impact Absorbing Frame, crush zone, crumple zone, crash zone, energy absorbing front structure

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1. INTRODUCTION

The present study is related to the crumple zone, crush zone or crash zone which are located at the front part of the vehicle to absorb the head on collision. And there are some disadvantages of the crumple zone too like it is very expensive to repair they gently increase the cost of the repairs after collision because the crumple zone is designed so effectively that even after a minor impact, the car will be often be un-drivable and must be repaired. To overcome this problem we have discovered the impact absorbing frame. The present study will overcome the problem because the present study that is impact absorbing frame that contains the impact absorbing springs that stretch backs the body and regains its original position.The material will be the magnesium based alloy which is known as the lightest and the strongest material that will not break off upon the hitting. Through which the body will be damaged less and the passengers will be safe.

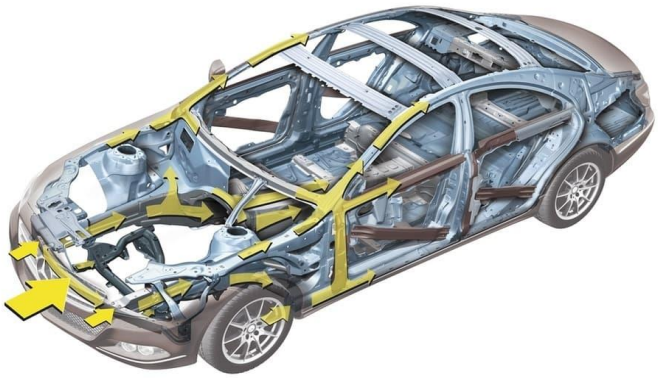

Figure 1 Impact transfer lines during frontal impact [1]

The problem with the present study with the safety of the passengers is that they got their legs injured because when heavy accidents occurs then the impact of the another car and the impact of the engine of the car will leads to the breakage of the body and it comes directly to the legs of the passengers and the driver through which they will be injured and may be the worst consequences, so to overcome the situation we have made the impact absorbing frame. In the present world the other strongest materials are also used such as carbon fibre but they only have the tendency to resist the impact for themselves but not to the vehicle body and the passengers they may not be breakable but they can’t save the passengers so to resist the impact the solid structure of cage must be required that can absorb the impact in the meantime. The potential for energy absorption within the front structure of a passenger vehicle may be optimized for specific loading e.g. high-speed rigid flat barrier impact.

In many vehicles energy absorption is provided by the axial collapse of longitudinal frame members. These structural members work well when loaded as intended but may not always perform so effectively in vehicle crashes on the road. In the study described here the controlled bending rather than axial collapse of the main longitudinal members has been used to reliably manage the energy from frontal impact.

2. DETAILED WORKING ANALYSIS OF THE ADVANCED FRAME

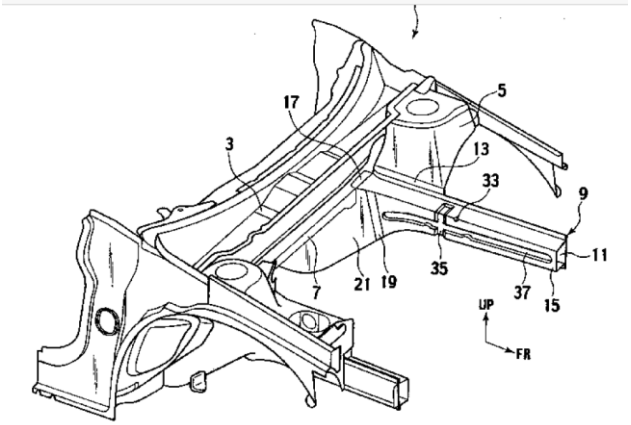

Figure 2 Working principle and nomenclature of the advanced frame

In the figure2, the points 1,3 the horizontal expansions of the cover case along the vehicle's leading part Support the front of the control tower 5, which is situated on the left and right sides of the shroud upper panel case 3. Furthermore, crossbeam 7 is located beneath the shroud upper panel case 3 and runs parallel to the vehicle's horizontal expansion. Each side member 9 is connected to the others by a support control tower 5 and a crossbeam 7. Flange 13 has formed on the back portion of the closure plate 11 that makes up front side member 9, and this flange 13 connects to the horizontal medial surface that supports control tower 5.The flange 17 is placed and fixed to the upper surface of crossbeam 7 at the rear end of the front side member main body 15. Furthermore, extension 21 connects the flange 19 of the rear end to the horizontal medial surface of the main body 15 of the front side component. The front side member 9 has a closed section structure, with the following components: the main body 15 of the front side member forming a flute profile (or a U-shaped cross-sectional plane);

Furthermore, the closure plate 11 is employed to open the closed front side component main body 15. Furthermore, the upwardly extending upper end flange 23 is arranged in the upper end of front side member main body 15; the upper wall 25 that extends inwardly from the lower end edge vehicular transverse direction of upper end flange 23; and the lower end edge vehicular transverse direction of upper end flange 23.The lower wall 29 that extends outwards from the lower end edge vehicular transverse direction of sidewall 27; the downward sidewall 27 that extends from the horizontal inner edge of upper wall 25; extension of the outside lateral margins of lower wall 29 from the downward lower end flange 31. Closure plate 11 connects to front side member main body 15 through lower end flange 31, which is positioned in higher end flange 23.Extension 21 connects to the rear end of the main body 15 of the front side member. The rear half of extension 21 connects to the previous floor.

Laterally on the corner part of front side member main body 15, which is approximately the middle part along the longitudinal direction of front side member main body 15, notch (or triangle bead) 33 forms flexural deformation and promotes bead, and this flexural deformation promotes the inner recess of bead towards front side member main body 15.Furthermore, rectangular depression 35 generates axial deformation and promotes bead in the position of notch 33 rear sides, and vertical direction extends through the medial surface of front side member 15 and crosses front side member 15 along end face and bottom surface. The connection bead 37, which is formed on the horizontal inner surface of the main body 15 of the front side member, extends in the longitudinal direction of the car or shock load transmission. Connect bead 37 and form and pass axial deformation with criss-cross and promote bead 35 once its side is visible.

3. FRONTAL CRASH IMPACT ON THE VEHICLE BODY

When the accidents occurs from the front the chassis acts as a main load bearing component. The front end of the chassis is designed to absorb the most amount of the impact energy. The chassis contributes up to 60% part in absorbing the impact while accidents.

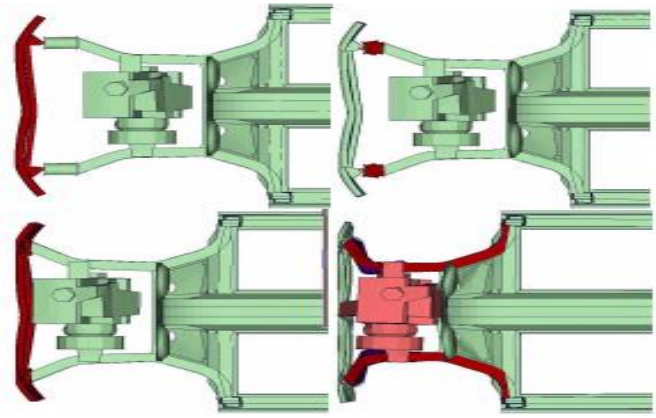

Figure 3 Collapse Mechanism of the innovative solution proposed

All cars undergo front- and side impact testing, which includes 64kph (40mph). Front impact test: to assess car's performance in severe accident 50kph (30mph) Side impact test: 29kph (18 mph) optional Pole impact test: to driver's head 40kph (25mph) child and adult pedestrian impact tests Crash Regulatory test and our impact absorbing frame have the capability of passing in each of the crash test.

Table 1 General energy absorption in the whole vehicle model

Part	Energy/J	Percent/%
Bumper cover	6407.4	4.63%
Radiator	3915.4	2.83%
Bumper cross beam	7227.62	5.23%
Energy Absorber	8782.24	6.35%
Front longitudinal beam	25508.3	18.45%
Hood	5031.18	3.64%
Front wall	3467.41	2.51%
Fender	660.75	0.48%
Power train	16.01	0.01%
Sub Frame	27307.96	19.75%
Guard Plate	1433.97	1.04%
Door	164.64	0.12%
Floor	7589.47	5.49%
Steering system	2394.560	1.73%

3.1. Simulation of the Impact absorbing Frame

The Eco-front bumper beam design has more than one intended function with respect to vehicle safety. The Stretch bent Aluminium extrusion plays a role in pedestrian impact, low and high-speed impact. In designing a passenger car front bumper system for pedestrian impact account should be taken of the maximum load levels thought to be acceptable for a lower leg. A stiff bumper designed only to provide structure and bodywork protection may produce high loading of a pedestrian’s lower leg should impact occur. To ensure that the bumper does not create unacceptably high loading the area behind the bumper fascia can be designed, should space

allow, creating loads within a lower leg that are of a suitable level to minimize injury. The impact energy absorbing structure of the frame member of vehicle comprises:

Be located at first element on the frame member, when shock load during along the axial loading of frame member, this element is used to promote the flexural deformation of frame member; Be located at second element on the frame member, when shock load during along the axial loading of frame member, this element is used to promote the axial deformation of frame member; and be connected the reinforcement plate on the frame member, Wherein frame member is configured to hold this reinforcement plate in the primary importance and the second place, and described primary importance is positioned at the next door of first element and a side that loads in shock load, and the described second place is positioned at first element and is reinforced the place that plate is strengthened.

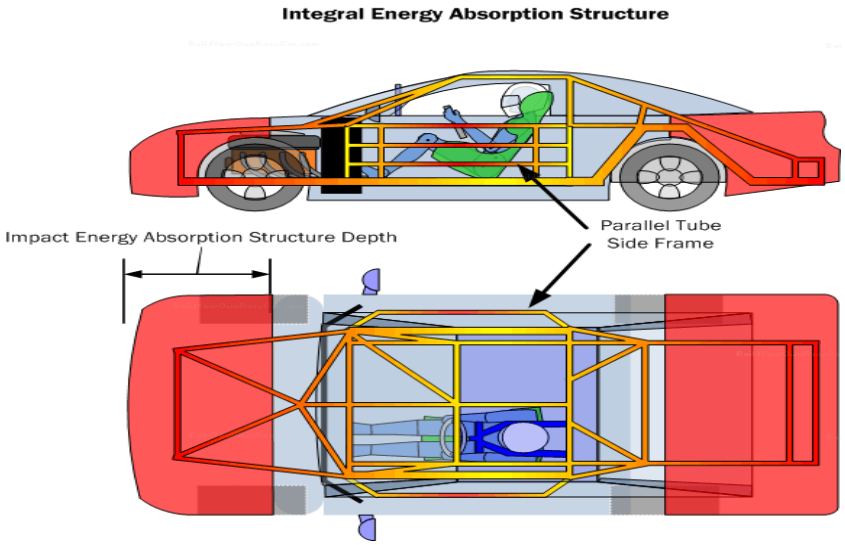

Figure 4 Energy absorption structure [6]

4. RESULTS AND DISCUSSION

All the vehicle body contains the simple outer frame and body and nothing is there in between them like no other support for the frame is given that can saves the vehicle body from damage. However, the different types of frames and chassis and roll cages are available but those are not capable of providing this much protection to the vehicle body outer frame. So we have discovered a type of cage frame known as impact absorbing frame that will be located inside the bonnet in the front of the engine and it will cover the front upper and under the engine also and while hitting with another car it will possess less damage.

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The requirements of frontal impact legislation and the comparative evaluations of consumer organisations have improved occupant crash protection. Passenger vehicle bodies have crumple zones developed through rigid flat barrier testing and improved passenger cell stability has resulted from consideration of offset deformable frontal impacts. Pressures to minimise cost and weight, whilst still maintaining satisfactory crash performance, could potentially lead to vehicle designs in which the crash behaviour of the structure has been optimised for barrier testing. The energy from a variety of different frontal impacts could be reliably managed within the structure of a medium sized passenger vehicle. The concept structural design developed within this project is intended to provide an acceptable amount of energy absorption independent of the precise orientation of objects with which vehicle collision may occur.

5. CONCLUSION

Advantage to the frame could be acknowledge by additional components and structures of the recent chassis and frames and could save the passengers sitting in the vehicle while any kind of incident because the cage and the frame is fully capable of saving and absorbing the impact from all the sides. We have made the impact absorbing frame. In the present world the other strongest materials are also used such as carbon fibre but they only have the tendency to resist the impact for themselves but not to the vehicle body and the passengers they may not be breakable but they can't save the passengers.

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