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DESIGN AND ANALYSIS OF CAR UMBRELLA

Mr.Dnyaneshwar.B, Sapkal
Asst. Prof. *Dept of Mechanical Engg*
Anuradha Engineering College Chikhli
Chikhli,India
sapkaldb@gmail.com

Mr.A.B.Wankhade
Asst. Prof. *Dept of Mechanical Engg*
Anuradha Engineering college Chikhli Chikhli,India

Abstract-

Car parking umbrella can be one of the effective solution for traditional car covers and the covered parking space which are only available in some of the big residential buildings, corporate offices and malls in big cities. Car umbrella can be carried at any location which can provide shelter to car and protect it from sunlight & rain. Various components of car umbrella will be designed using IS standards. Selection of covering sheets material will be done by studying properties of various materials. 3D modeling will be done in Solid works. Structural analysis of various components will be carried out in ANSYS.

Keywords— Solid works, LAM ,ANSYS

INTRODUCTION

Vehicles have become a primary factor in our lifestyle. It is one the best means of transportation on a daily basis. Due to the advancement in technology, people tend to use more automatic systems these days. Thus, engineers try to change manual systems into automatic systems in order to make people's lives easier. Parking in an unshaded area gave rise of greenhouse problem. It is the problem of conversion of solar radiation entering through the windows of a car into long wave thermal radiation and trapped inside car cabin causes temperature increase of cabin components. Thereby, use of cardboard car shades to reduce the interior temperatures inside parked automobile has become popular in Baghdad and other hot regions in Iraq. Temperature inside the vehicle cabin is very important to provide comfortless to the car passenger. The temperature can be controlled by using air conditioning system that can be operated when the car engine is in operation. However, when the car is left or parked directly under the sunlight, temperature inside the cabin will be increased. Sealed automobiles commonly encounter interior temperature conditions that are tremendously uncomfortable to the passengers.

Many car users are faced a hot interior after a certain hours of parking in open space or unshaded parking area. The heat under such parking conditions causes the car cabin and interior temperature to reach up to 80ºC average. The accumulation of thermal energy inside the vehicle with undesired temperature rise would cause the interior parts to degrade because they normally are subjected to wear and tear. Degradation may shorten the life span of the various components inside the car, especially electronic devices. Passengers are also being affected with the thermal condition inside the vehicle itself. The car user is forced to wait for a period of time around 2 – 5 minutes before getting into car to let the interior condition cool down either by rolling the window or running the air conditioner system (A/C) at high speed that really affect the fuel consumption.

LITERATURE REVIEW

Saad Bin Abul Kasheem. (2005) Constructed automatic device on vehicle to prevent heat penetration inside the car body. Their device is fully autonomous to cover the car when parked in outside parking. Their system will prevent any vehicle from getting affected by heat produced by the solar energy. Solid works design and simulation has been done to analyze the required power by the system. Finally, a prototype has been built and the feasibility has been checked

R K Tyagi (2013) done work an automatic car cover is proposed which will opens itself with the help of push button. It covers the whole car with a thin, but a strong material that not only protects the car from rain, dust and mud (in parked situation) but, also from minor scratches. An assembly of different diameter, concentric cylinders is used to form hoisting pole and also, so that it could be contained in small space when not in use. The cover material is attached to the top of the innermost cylinder on both sides and to a rolling rod, which has the cover rolled on it. For the accomplishment of our task we are using a simple but dependable mechanism of rack-and-

pinion gears. A flexible rack is attached to innermost of the 4 concentric, different diameter hollow cylinders. The pinion is attached to a motor, which derives its power from the car battery. As the pinion moves, the rack moves and pushes the innermost cylinder upwards. The bottom of every inner cylinder is attached to the top of the just outer cylinder, but providing the linear motion between the two. When the rack moves, the innermost cylinder is pushed, which in turn, after being completely hoisted makes the second inner cylinder to move. The After second the third cylinder is hoisted and with it the complete four cylinder pole structure is formed. After complete hoisting, whole structure is rotated along the rear parallel axis of the car. The cover takes the shape of the car and the car is well protected. After complete hoisting, whole structure is rotated along the rear parallel axis of the car. The cover takes the shape of the car and the car is well protected. It is most suited for sports car, because sports car generally have open roof.

W. I. S. J. de Alwis (2016) came up with i-Umb, a new device which helps especially to the disabled people in wheelchairs. This research paper briefly describes the research problem, the observations, and researchers which have done for these issues, the new i-umb device and its functionalities, and how our device would help them to solve those problems

Issam Mohammed Ali Aljubury (2015) investigated the effects of solar radiation on car cabin components (dashboard, steering wheel, seat, and inside air). The test vehicle was oriented to face south to ensure maximum (thermal) unload on the front windscreen. Six different parking conditions were investigated. A suggested car cover was examined experimentally. The measurements were recorded for clear sky summer days started at 8 A.M. till 5 P.M. Results show that interior air temperature in unshaded parked car reaches 70ºC and dashboard temperature can approach 100ºC. While, cardboard car shade inside the car not reduce the air temperature inside it. Suggested car cover with 1 cm part-down side windows reduced temperature of cabin components by 70 % in average compare to the base case

Suh Ted Justin [US], Publication No-US2009140541, 2009-06-04, this invention provides automatic car cover system, driven by electric motors, for a car, which is equipped with an automatic opening/closing trunk lid is provided. It includes one cover runner, one holster, one holster casing, one guide, onceover sheet, and one cover sheet un-folder. The cover runner is a small electric motor driven vehicle equipped with caterpillars, which are comprised of magnetic plates covered with rubber. The holster pushes out/rewinds the cover runner, the guide, and the cover sheet with un-folder. The holster comes out of and goes into trunk of the car with aid of a line connected to a reverse power motor installed in the holster

Guoping Yang, Publication No- CN102514468, 2012-06-27, the invention provides automatic car cover, which comprises a rotating wheel disc and a supporting frame, wherein the rotating wheel disc is mounted at one end of the supporting frame; the other rotating shaft is arranged at the lower edge part of a vertical plate of a box cap; the rotating wheel disc is provided with a rotating disc housing provided with a cover body exit; a wheel disc rotating shaft is arranged in the rotating disc housing; the cover body is connected with the wheel disc rotating shaft and curled in the rotating wheel disc; and a keel frame formed by a plurality of longitudinal anti-fatigue thin steel wires of a keel and a plurality of transverse flexible pressure springs is arranged in the middle of the cover body

Xu hua Wu, Publication No- CN101734128, 2010-06-16, the invention provides a built-in type car cover. The downside of the car trunk is internally provided with a built-in automatic cover-winding device. The middle of the built-in automatic cover-winding device is provided with transverse scroll bar, the car cover is wound on the scroll bar, and the scroll bar is connected to an instrumentation operation station in the car by setting leads in an electrically winding way. When the car runs, the built-in car cover is wound inside the downside of the car trunk, when the car needs to be covered during the parking, the cover can be drawn out and pulled forward from the back to cover the whole car body, and the winding and loosing of the scroll bar are operated by an electric button on an instrument panel in the car

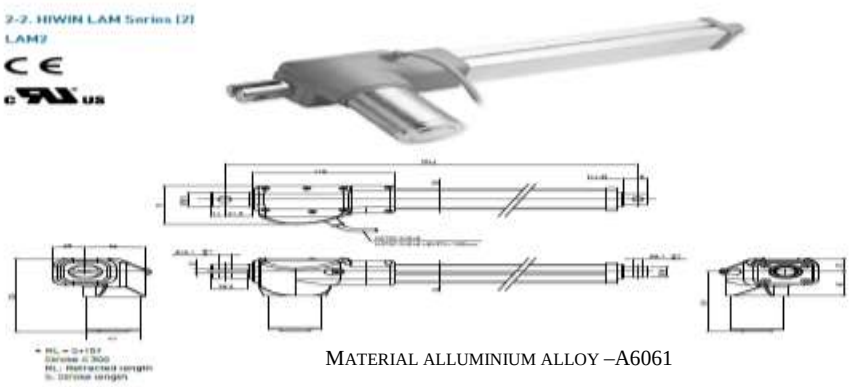
The specific objectives of the work are,

- To study various researches done in the field related to Car umbrella.
- To select the proper mechanism for satisfactory working of Car umbrella.
- To study the properties of various materials to use it for covering sheet.
- To analyze the various components of mechanism of car umbrella for efficient working.
- To carry out 3D modeling in Solid works.
- To analyze the structural strength of each component of the mechanism using Ansys

RESEARCH METHODOLOGY

1. Study of various properties of materials which can be used as covering sheet & selection of best material for application
2. Selection of mechanism for the proper working of Car Umbrella after testing different mechanisms in Solid works software for its working.

3. After finalizing mechanism design of major components of mechanism based on ISO standards will be done.
4. 3D modeling of components of mechanism of car umbrella in Solid works.
5. Structural analysis of each component of mechanism in ANSYS.
6. If given calculation is fail then changes has been made according to expected result.



MATERIAL ALLUMINIUM ALLOY –A6061

Physical properties	
Density (ρ)	2.70 g/cm3[1]
Mechanical properties	
Young's modulus (E)	68.9 GPa (9,990 ksi)
Tensile strength (σt)	124–290 MPa (18.0–42.1 ksi)
Elongation (ε) **at break**	12–25%
Poisson's ratio (ν)	0.33
Thermal properties	
Melting temperature (Tm)	585 °C (1,085 °F)
Thermal conductivity (k)	151–202 W/(m·K)
Linear thermal expansion coefficient (α)	2.32×10^{-5} K^{-1}
Specific heat capacity (c)	897 J/(kg·K)
Electrical properties	
Volume resistivity (ρ)	32.5–39.2 nOhm·m

3DMODEL OF CAR UMBRELLA

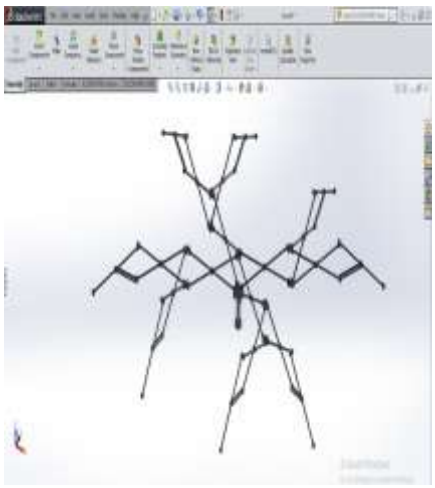


Fig. 1 Opening of Linkages

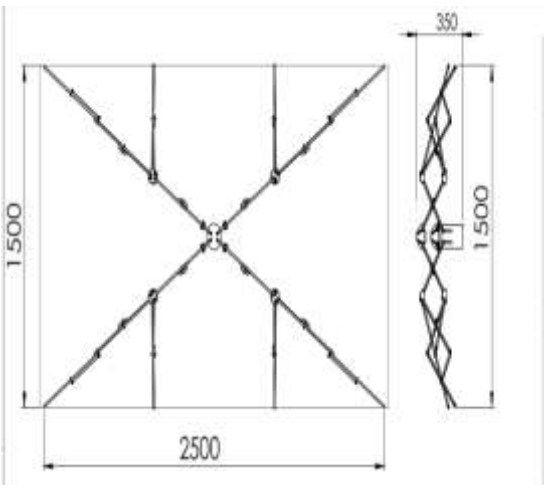


Fig. 2.Linkages engineering drawing

TABLE II.COMPONANT OF CAR UMBRELLA

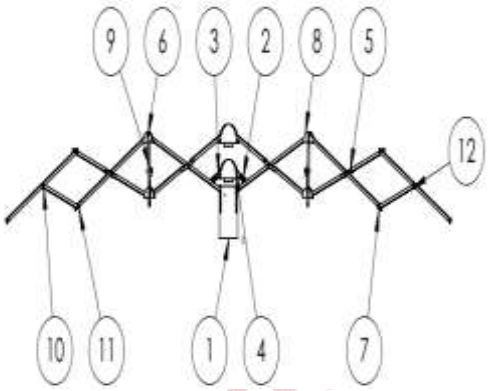


Fig. 3. Assembly of Linkages

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Fig. 4.Skelton Isometric view

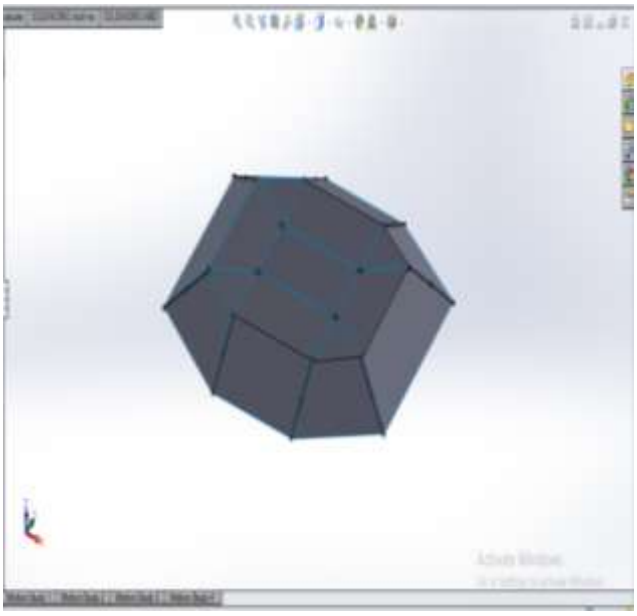

Fig.5..Linkages with Cover Material

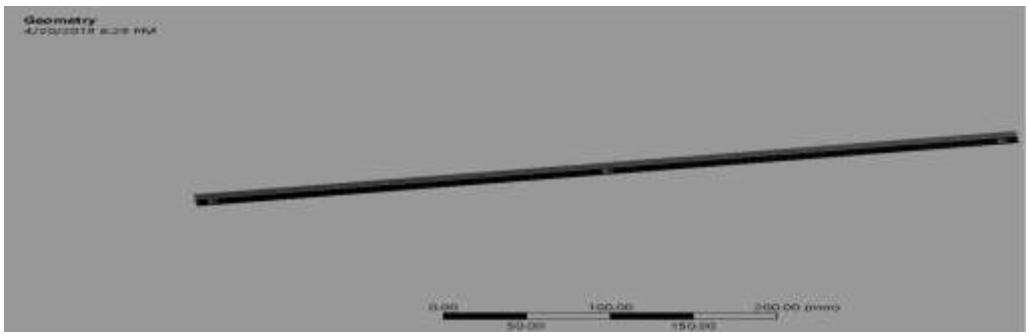

Fig:6. Geometry of Link

ANSYS RESULT AND DISCUSSION

On the basis of analytical calculation the design parameter has taken in the design assembly is analyzed. From result of under UDL link whose dimension are calculated and with the help of ANSYS analysis. We get value of equivalent stress100.71 MPa.i.e. Nearly equal to 101 MPa. Whereas we are using Aluminum 6061 who's Yield stress value is 240 MPa and Allowable stress value is 120 MPa. So as our design assembly is safe to use under actual working condition.

TABLE III DESIGN PARAMETRER OF ANALYTICAL CALCULATION BASED

Sr. No	Properties of Aluminum 6061	Values
1	Young's modulus	70 Gpa
2	Yield stress (σ_y)	240MPa
3	Tensile Strength (σ_{uts})	260 MPa
4	Allowable stress	120N/mm^2

Sr. No	Parameter	Values
1	Design Wind pressure	86N/m2
2	Wind Load Acting On Umbrella	2.12 KN
3	Load on single Link	265 N
4	Stroke of Linear Actuator required to full open the car umbrella	250 mm
5	Load which linear actuator has to lift	2170 N
6	Equivallant stress value	101 Mpa

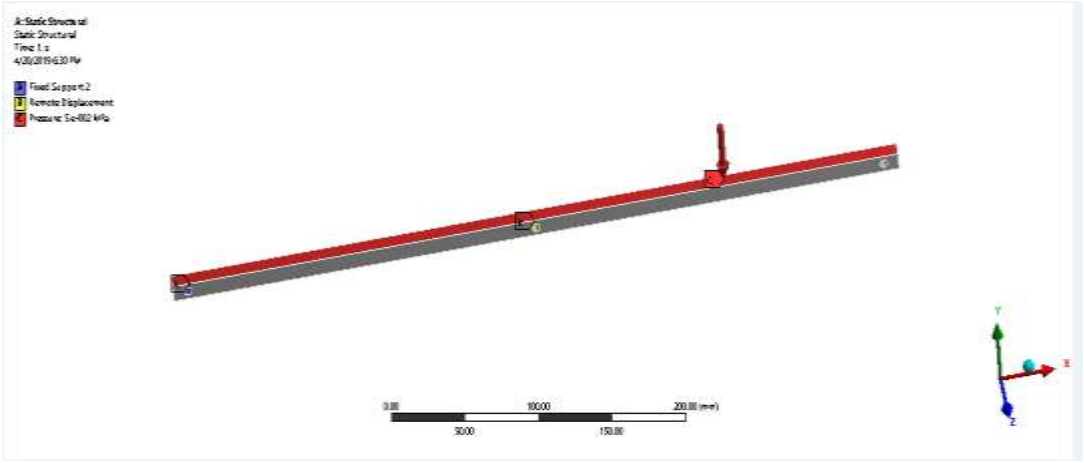

Fig. 7. Static structural

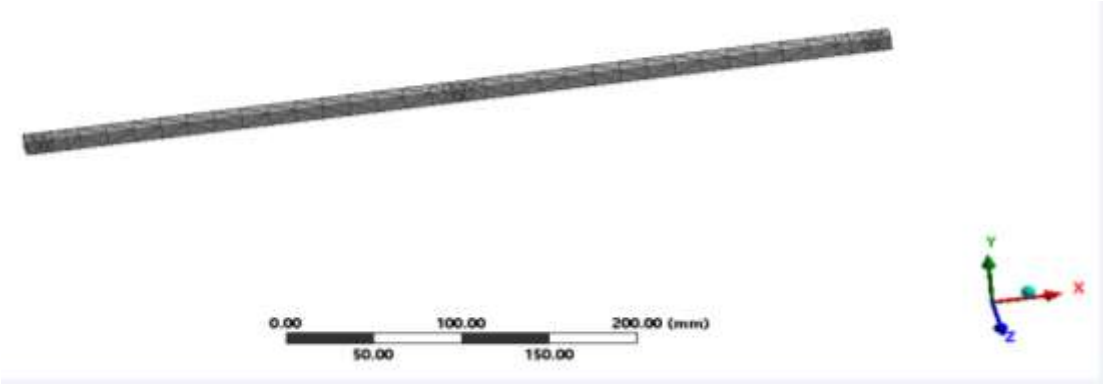

Fig. 8.Meshing of link

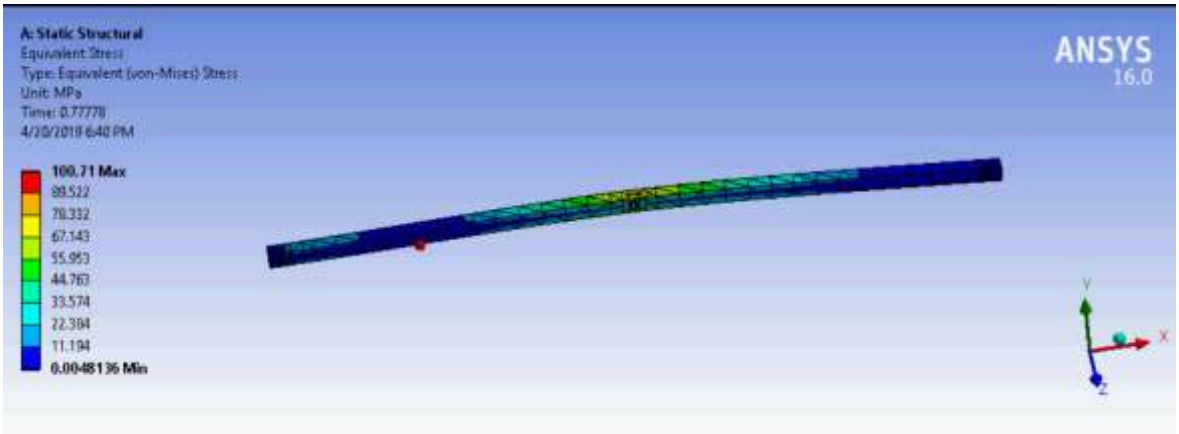

Fig. 9. Equivalent stress

Conclusion:

This paper will confirms that the product is fair solution to the heating problem in vehicles when parked in uncovered area. It can protect the car from rain and sunlight when parked..Also gives us the exact value of various parameter as per the consideration which is very useful for future research. As in this field not much research is done until now, in future a system can also be developed which will protect the car from sunlight and rain in moving conditions too.

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