

DESIGN AND DEVELOPMENT OF ADVANCED WINDSHIELD WIPER

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Abstract: Most transportation vehicles did not have wipers. The history of the windshield wiper began with the invention of the automobile. The project goal is to modify the existing design of Car Wiper mechanisms. The main objective is to design and manufacture a new mechanism to cover the complete area of the wind screen. Different types of mechanisms like Cam- Follower, Slider-Crank, Rack-Pinion, etc. or a combination of these mechanisms will be explored used to achieve the goal of this project. At the beginning, the project needs to achieve the design and some analysis of wiper mechanism. Manufacturing of the improved wiper will be carried out.

1. INTRODUCTION

In Innovative thoughts, engineers delivered out the ones thoughts which might be intended to enhance the appearing of the machines. These thoughts decorate the powerful functioning of the machines wherein they both update the cutting-edge technique of appearing of a device or upload a further layout for the higher appearing of a mechanism. Engineers are making steps each day to ensure that machines withinside the locomotive enterprise are running withinside the proper way and withinside the ultra-modern superior generation with most impetus given closer to the protection and luxury of someone whilst riding a locomotive. A big range of avoidable injuries show up each day because of minute problems associated with system and their associated designs calibrated interior a locomotive like car, bus etc. Such problems relate to braking system, seat belt, windshield wiper mechanism etc. Thus, withinside the assignment to be described right here it's miles approximately to enhance the preceding mechanism of the windshield wiper to a brand new and greater powerful one which could carry out higher than the preceding one.

2. LITERATURE SURVEY

The automobile windshield wiper mechanism is a very important research field in modern times. Since it is related to passenger safety and the reputation of the automotive company that makes the corresponding cars, this is not the first project in this field. Several studies have been conducted in this discipline and some are still ongoing. Studying some related previous work will give us a better understanding of the size of the car's windshield wiper mechanism.

In February 2014, Dr. Frederic Bernardin, Dr. Ronald Bremond and others published a research paper in “Accident Analysis and its Prevention” journal in

which they proposed a methodology to assess the visual performance of a car windshield through rain. They recorded data from 40 observers under a controlled environment and identified the key issues related to effects of rainfall on the car windshield in terms of visibility.

In the same year, Dr. Gabor Bodai and Dr. Tibor J. Goda published a research on another very important area of concern in the same discipline i.e. sliding friction of a wiper blade on a car windshield. The research was published in Tribology International on February 2014. In this research, they executed a combined numerical and experimental investigation on wiper blade and windshield glass contact. They used a commercial wiper to study the effects of friction between windshield and wiper and relevant issues related to it.

In April 2015, Lubina Alazzawi and Avik Chakravarty published a research paper related to windshield wiper mechanism in the international journal of engineering and technology. They attempted to develop an automated, reconfigurable rain sensitive windshield wiper by combining the conventional windshield wiper with Arduino technology.

The above discussed researches are just few of the works done in the field of wiper mechanism of a car windshield. This topic carries a great weightage and burden on the automobile companies of today's world such that day to day developments are going on in this field.

SELVERAJ A/L SUBRAMANIAM developed the new wiper retractor system which reduces the weariness of the rubber of the wiper which cleans the windscreen from moist and dirt.

With the new system design, as the driver brings the car to a stop and turns off the ignition switch, the wiper retractor will be triggered to extend and move the wiper blade away from the windscreen. There tractor action is reversed when the ignition key is turned on. Almost all car wipers are retracted manually by hand and it is very troublesome at times.

3. COMPARITIVE STUDY

The purpose of this project is to design and analyze a new automotive windshield wiper retractor system that can increase the service life of the blades when exposed to excessive heat and humidity. The development and modification project of this windshield wiper mechanism is a project of the university because undergraduates in this field have not done or tracked any previous work. However, undergraduates from other universities have done related projects under the windshield wiper mechanism. Our work can be compared with your work and conducted research to prove the uniqueness of the project.

Mohammad Fotouhi, Ali Eydgahi, Tom Malaby of University of Maryland had worked on design of a rain-based speed controller for automobile windshield wiper motor. Under this design project, the students attempted to develop a windshield wiper mechanism that can automatically adjust its frequency of operation based on the amount of rainfall. This was done to increase the

efficiency of windshield wiper system of a car and respective safety related issues during rainfall.

Obadah Abdulrazeq, Chris Ramprashad and others from Rutgers University, New Jersey worked on vehicle electronics automation in which they attempted to develop a mechanism that can control head lights and windshield wipers of a car with respect to amount of environmental light present and precipitation respectively. They tried to automate the basic systems of a car to provide a comfortable drive to the passenger.

4. CONSTRAINTS AND METHODOLOGY

GEOMETRICAL CONSTRAINTS

Once the planning is approved, subsequent step is to start out drawing the planning manually, then transfer it to a drawing software, like Computer Aided When considering the dimensions, the designer must adopt a size that's suitable for the installation location of the ultimate product. additionally, the dimensions of the wiper frame must be considered along side the dimensions of the windshield to be cleaned

SUSTAINABILITY

As the quality for correct and efficient design, sustainability is at the core of each designer. Taking under consideration the wear and tear, reuse and adaptableness of the whole design of the merchandise and its subsystems and components, the quality ensures that the planning of the merchandise is durable and effective to effectively achieve its intended purpose.

ENVIRONMENTAL

Regarding environmental aspects like design constraints, the choice of materials is vital to make sure the flexibility of the merchandise design and to use as many places with different environmental conditions as possible. In areas of wet and cold climates, there's more rain, and therefore the design of the merchandise and its components can withstand the influence of water, low temperatures and snow on the windshield.

SOCIAL

The social aspect of product design aims to bridge the gap between users and therefore the design itself in terms of aesthetics, simple use, and overall safety. Aesthetics as a general appearance mainly refers to the visual appeal of a product design to its consumers (ie, car manufacturers and end users). the looks of an object may be a feature that folks will notice initially glance, but in some ways, the looks could also be different, from a really personal point of view to a general view of surface treatment.

ECONOMIC

When choosing a design for a product, it's always important to think about the prices that it'll bear. an honest design should not be too expensive. It should be inexpensive. the value of the components included within the design will affect the value of the planning. it's advisable to think about the value of the machine members. it's recommended to use the right parts in their respective locations to attenuate costs.

MANUFACTURABILITY

When choosing a product design, it's important to think about the convenience of manufacture of its parts. simple part fabrication enhances rapid production of dimensionally accurate parts. additionally, when repairing damaged parts, it's easier to switch parts of straightforward design than complex ones. When selecting parts, it's also recommended to think about parts that are easy to manufacture and can not warp or break. within the manufacturing process, various parts must be selected taking under consideration the situation to be installed and the way they will withstand different voltages and torques.

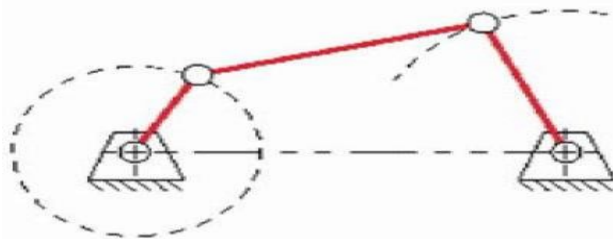
SAFETY

This is one among the foremost important parameters to think about when designing a product to be manufactured. Safety includes possible accidents and injuries to machine operators. These accidents and injuries must be predicted and addressed during product processing. the planning nomenclature should provide super safety for the operator, because it doesn't take up much space, because it's a rotating machine which will cause injury at any time.

MECHANISM IMPLEMENTATION

CRANK ROCKER MECHANISM

The main mechanism during this design is that the four-bar mechanism, which receives power from the motor and transmits it to external components. The four-bar mechanism consists of 4 rigid links connected end to finish to make a closed-loop system. additionally, one among the links, called the bottom link, is during a fixed resting position.



$$S + L \leq P + Q$$

Where:

S = length of shortest link

L = length of longest link

P = length of one remaining link

Q = length of other remaining link

For a crank-rocker mechanism, equation can be simplified to:

$$S + L < P + Q$$

CRANK SLIDER MECHANISM

This may be a mechanism in motors, pumps, windshield wipers, and lots of other machines. If the crank is turned, the angular motion is converted into linear motion of the slider, and therefore the input torque is converted into the force working on the slider. If the slider is forced to maneuver, the linear motion becomes a rotation, and therefore the force becomes a torque. If the crank rotates at a continuing speed ω rad / s, the slider movement isn't completely harmonious

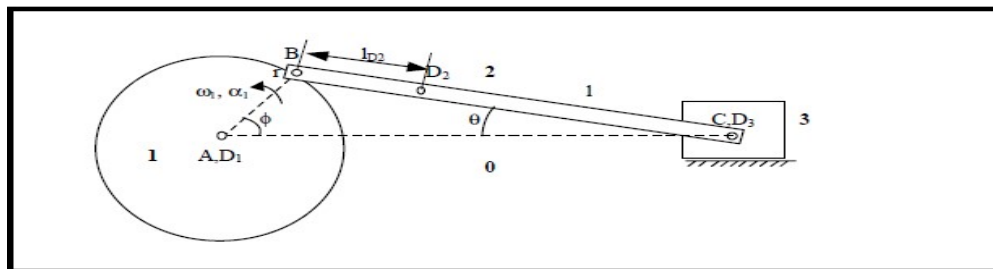


Figure 3: Crank Slider Mechanism Schematic

THEORY AND THEORITICAL CALCULATION

An important feature within the analysis of mechanism is that the number of degree of freedom of the linkage. The degree of freedom are often defined because the number of actuators needed to work the mechanism. Any actuator of the mechanism might be manually moving one link to a different position or connecting the motor to the shaft of 1 link. Mobility is that the number of degrees of freedom of a mechanism and given the symbol M. Grumbler's equation is employed to calculate the degrees of freedom for planar linkages joined with common joints and is given by

$$M = 3(n - 1) - 2j_p - j_h$$

Where:

M = degrees of freedom

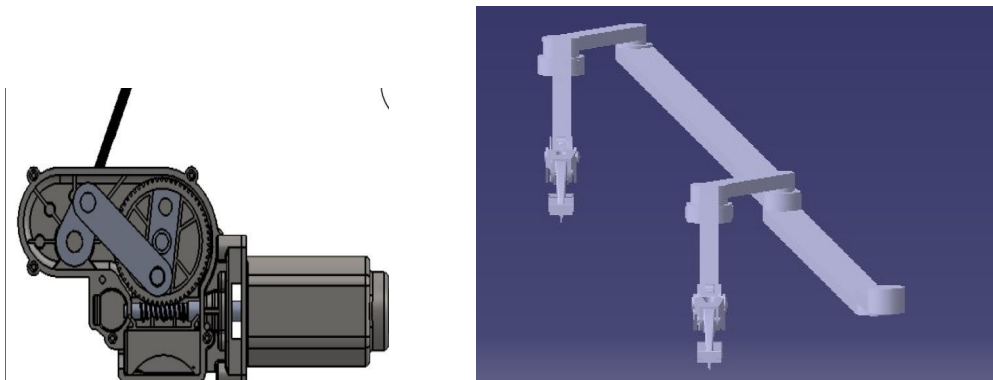
n = total number of links in the mechanism

j_p = total number of primary joints (pins or sliding joints)

j_h = total of higher-order joints (cam or gear joints)

5.SYSTEM DESIGN

In regard to project metrics; it is going to be mainly focused on the mechanisms, actuator and electronic control system. The automobile's battery is the main source of power to any vehicle electrical and electronic systems and either a 12/24V battery is sufficient for this purpose to drive the actuator which is a medium sized DC motor of the range 6-12V and all other on-board components that control the mechanisms and actuators. The development of sensors and accurate control features such as the electronic control module (ECM) saves on space by minimizing the connections of wires that are replaced by sensors.



6.SYSTEM ANALYSIS

EXPERIMENTAL SETUP , SENSORS AND DATA ACQUISITION SYSTEM

In our project, the input power comes from a DC motor. The motor will be located behind the mechanism and will be covered for aesthetic reasons. The motor will power the mechanism to run and start cleaning the windshield. In addition, we will use a 12V ordinary motor, because this power is enough to make the wiper work. The specifications of the motor are as follows:

- POWER : 45W
- VOLTAGE DC 12V
- WORKING LIFE : 300,000 HRS
- FITTING POSITION : FRONT

RESULT ANALYSIS AND DISCUSION

First of all before we start to test our new mechanism, it's clear from the region cleaned by the wiper is limited. And using our new mechanism we can reach to

the area . At the first process of this mechanism. There will be two wipers, one of them is the original wiper and the other one is the extension wiper which will extend to clean the whole area of the windshield. At the rest, the two wipers are at zero degree. The two wipers started moving to clean the windshield and we can see the extra wiper started increasing but not reaches the maximum extension yet. that two wipers reach the final point. We can see that the extension wiper extends at the maximum travel and clean the uncover area. While the original wiper remains the same from the first point to the end point

7.CONCLUSION

Concluding the discussions it might be believed that this task is predicted towards reforming the car business by outlining an nearly as good as ever auto wiper component which will manage perceivability issues amid occasions of rain. the normal wiper instruments introduced in autos can halfway clear the windshield due to which water dribbling issues are inescapable. This auto windscreen wiper instrument can clean the whole windshield of the auto. Subsequently, it'll be helpful as in it'll enhance perceivability of the driving force up to a palatable separation and during this way dodge unmerited and accidental impacts on streets. Once the design is approved, the next step is to start drawing the design manually, then transfer it to a drawing software, such as Computer Aided .When considering the size, the designer must adopt a size that is suitable for the installation location of the final product. In addition, the size of the wiper frame must be considered together with the size of the windshield to be cleaned.

8.REFERENCE

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