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Design and Development of Smart Wiper

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ABSTRACT

Amidst the world of automobiles, where engines roar and tires grip the pavement, there exists a humble yet indispensable protector of our driving experience – the wiper blade. These unassuming strips of rubber and metal, often overlooked, serve as the silent sentinels that ensure our view of the open road remains clear, our travels safe. However, when our vehicles sit idle for extended periods, a subtle and insidious threat looms over these trusty companions – neglect.

As time passes, dust, debris, and the uninvited guests of leaves and other natural detritus settle on the windshield. The sun's relentless heat compounds this issue, gradually eroding the condition of both wiper blades and the windshield itself. The accumulated debris poses a significant risk when the wiper system springs back to life. The contact between the wiper blades and this unwelcome company can lead to scratching or gouging of the windshield, compromising our precious visibility and, more critically, our safety.

INTRODUCTION

The maintenance and care of your vehicle, particularly when it's parked for an extended period, can significantly impact its longevity and performance. One often overlooked aspect of this care is the condition of the wiper blades and the potential hazards associated with their neglect. When a car sits idle for an extended period, it becomes susceptible to the accumulation of dust, debris, and even leaves on the windshield, which, when coupled with the natural effects of environmental heat, can result in damage to both the wiper blades and the windshield itself.

This accumulation of foreign materials on the wiper blade area can pose a considerable risk when you eventually start the wiper system. The contact between the wiper blades and the debris can lead to scratching or gouging of the windshield glass, compromising visibility and safety. Additionally, the continuous contact of wiper blades with the windshield, particularly in high-temperature environments, can cause the rubber blades to melt and deteriorate, rendering them less effective or even useless when you need them the most.

In this discussion, we will explore the potential problems and solutions associated with the care and maintenance of your wiper blades, highlighting the importance of regularly inspecting and cleaning this critical component of your vehicle to ensure safe driving and optimal performance, even after prolonged periods of inactivity.

ANALYSIS

The issue at hand pertains to the overlooked aspect of vehicle maintenance, particularly when vehicles are parked for extended periods. This negligence extends to the condition of wiper blades, which, when disregarded, can have severe consequences. Vehicle at rest become magnets for dust, debris, and even leaves settling on the windshield. Over time, the combined effects of these foreign materials and environmental heat can lead to damage, affecting both the wiper blades and the windshield itself.

The accumulation of these elements on the wiper blade region creates a significant hazard when the wiper system is reactivated. The contact between wiper blades and the accumulated debris can result in the scratching or gouging of the windshield glass, putting visibility and overall safety at risk. Moreover, the continuous friction of wiper blades against the windshield, particularly in high-temperature conditions, can cause the rubber blades to melt and deteriorate, rendering them less effective or even entirely nonfunctional precisely when they are most needed.

This predicament calls for urgent attention to the care and maintenance of wiper blades, an often-underappreciated but vital vehicle component. In this discussion, we aim to uncover the potential problems and provide practical solutions related to the care and maintenance of wiper blades. Emphasizing the significance of routine inspections and cleaning, we intend to ensure not only safe driving but also optimal performance, even after prolonged periods of vehicle inactivity.

- Regular Cleaning and Inspection: Many car owners make it a habit to clean their vehicles, including the windshield and wiper blades, on a regular basis. This helps remove dust, debris, and leaves that may have accumulated during parking.
- Use of Windshield Covers: Some drivers use windshield covers when their cars are parked for extended periods. These covers help protect the windshield and wiper blades from dust, leaves, and direct sunlight, reducing the risk of damage.
- Parking in Covered Areas: Parking in covered or sheltered areas can minimize exposure to environmental In this discussion, we embark on a journey to reveal the hidden perils of wiper blade neglect and uncover the solutions that can save us from this predicament. We will emphasize the paramount importance of regularly inspecting and caring for this uncelebrated yet critical component of our vehicles. This proactive approach guarantees not only our safety but also the longevity and optimal performance of our ever-faithful wiper blades, even after prolonged periods of inactivity. So, let us shed light on the shadows of ignorance and ensure that safety and peak performance remain steadfast companions on the open road.
- Wiper Blade Lift Feature: Modern cars often come equipped with a "wiper blade lift" feature that allows the wiper arms to be lifted away from the windshield, making it easier to clean the blades and the windshield itself.

METHODOLOGY

Data Collection and Analysis: Gather data on common wiper blade and windshield issues during extended vehicle parking. Analyze existing maintenance practices and their effectiveness in preventing these issues.

Literature Review: Review existing literature on wiper blade and windshield care during vehicle inactivity. Investigate available solutions, including wiper blade lift features and windshield covers.

Identification of Best Practices: Identify best practices from the literature review and real-world cases. Consider the use of windshield covers, parking in covered areas, and wiper blade lift features.

Prototype Development: Develop a prototype or concept for an automated wiper blade and windshield care system. This system could include a cover, a wiper blade lift mechanism, and possibly a cleaning system.

Testing and Evaluation: Test the effectiveness of the prototype in preventing dust, debris, and heat-related damage. Evaluate the impact on wiper blade and windshield condition over an extended period.

Dissemination: Promote the innovative system through various channels, including automotive publications and social media. Raise awareness about the importance of wiper blade and windshield care during vehicle inactivity.

By following this methodology, the proposed system aims to provide an effective and user-friendly solution to the common problem of wiper blade and windshield care during extended vehicle parking, ensuring the longevity and optimal performance of these vital components.

ARDUINO UNO SPECIFICATIONS

Microcontroller: ATmega328P – 8-bit AVR family microcontroller
Operating Voltage: 5V
Recommended Input Voltage: 7-12V
Input Voltage ranges: 6-20V
Analog Input Pins: 6 (A0 – A5)
Digital I/O Pins: 14 (D0 – D13)
PWM Digital I/O Pins: 6
DC Current on I/O Pins: 40 mA
DC Current on 3.3V Pin: 50 mA
Flash Memory: 32 KB (0.5 KB is used for Bootloader) SRAM: 2 KB
EEPROM: 1 KB

Frequency (Clock Speed) : 16 MHz
LED_BUILTIN: 13
Length: 68.6 mm
Width: 58.4 mm
Weight: 25 g

LOGIC

```
# Pseudo code for actuation of electrical actuator based on  vehicle ignition status
# Define input pins for vehicle ignition status and output pin  for actuator control
ignition_pin = 12
actuator_pin = 8
# Initialize the actuator to the off state
actuator_state = False
# Function to control the actuator
def control_actuator(state):
if state:
# Turn on the actuator
# Add code here to actuate the actuator (e.g., apply power to  extend it)
print("Actuator ON")
else:
# Turn off the actuator
# Add code here to deactivate the actuator (e.g., cut power to  retract it)
print("Actuator OFF")
# Main program loop
while True:
# Read the ignition status
ignition_status = read_ignition_status (ignition_pin)  # Check if the ignition status has changed
if ignition_status != actuator_state:
actuator_state = ignition_status
control_actuator(actuator_state)
```

CALCULATION

Load-Bearing Area:

Calculate the load-bearing area (A) to support the given load. We'll use a safety factor of 2.
Load-Bearing Area (A) = Load (F) / Allowable Stress (σ) Load (F) = 58.8 N
Allowable Stress (σ) -Depending on the material, for a conservative choice, assume σ = 69 MPa (for aluminum) or 190 MPa (for stainless steel).

Dimensions: Length (L): 500 mm (Height); Width (W): 300 mm
Now, calculate the required thickness (T) using the formula: T = A / (L * W)
Material Selection: Choose a material that can withstand the calculated stress. For this example, we will use aluminum alloy with an allowable stress of 69 MPa.
Using the given values and formula, calculate the thickness (T):
T = A / (L * W) T = (58.8 N) / (69 MPa * (10^6 N/m^2) * (500 mm * 0.001 m) * (300 mm * 0.001 m))
T ≈ 0.002 m
So, the required thickness (T) is approximately 3 mm. Length (L): 500 mm
Width (W): 300 mm
Thickness (T): 3 mm (for added safety based on your requirements)
This design assumes a conservative approach with a safety factor of 2, which should ensure that the adapter can safely support the given load. However, considering other factors such as load distribution and potential stress concentration in real-world applications
Bolt Specifications: Bolt Size: M8; Bolt Grade: 8.8
Length: 25 mm (ensure the threaded portion is sufficient for the application)
Head Type: Hex head
Material Selection: Choose a high-strength material for the bolt, such as alloy steel, which is typical for grade 8.8 bolts.
Tensile Strength: Determine the tensile strength of an M8 8.8 grade bolt. The tensile strength is typically around 800MPa (Mega Pascal).
Load Calculation: The maximum carrying load is 150 N.
Safety Factor: Determine the desired safety factor, typically 2 for most applications. In this case, we will use a FOS of 2.
Required Clamping Force:
Calculate the required clamping force using the load and safety factor:
Required Clamping Force = Maximum Load × Safety Factor Required Clamping Force = 150 N × 2 = 300 N

CONCLUSION

We have successfully completed a project on smart wiper used in vehicles with the help of research papers. We have successfully designed and developing a smart wiper for automobile vehicles. It is a call to arms, an invitation to safeguard these modest yet vital protectors of our driving experiences. Through this project we ensure both the longevity of our vehicles and the safety of our journeys

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