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Ergonomic and Efficient Button Operated Gear Shifting System in Two Wheeler

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ABSTRACT: Automobile gear shift control apparatuses come with a variety of control systems and ways for managing the gear shifting mechanisms. Clutch and gearbox work together to transfer the engine's rotational power to the driving wheels. As the gear is moved up, the load capacity and speed ratio will change. As gears are changed, the rotational output will rise. When shifting the gear down, the rotational speed will drop. In this project, the ends of the gear rod are connected to two electromagnets. Additionally, there will be two buttons near the left hand that will activate this. One of the most crucial control devices for driving is an automotive gear shifter, and both driving performance and safety are directly impacted by its user-centered design. Due to their benefits, which include convenience of shifting and efficient use of interior space, shift-by-wire systems with electronic shift buttons have supplanted traditional transmission systems in recent years.

KEY WORDS: Bike, Battery, Electro-Magnets, Push Button, Mild Steel rods, Circuit system, Battery Box.

I. INTRODUCTION

A vehicle's ability to shift gears is essential and has a direct impact on driver comfort, safety, and performance. The physical exertion and coordination required for traditional manual gear shifting can be taxing, particularly during lengthy rides or in crowded traffic. People with limited mobility or physical limitations may also find this traditional approach challenging. An effective and comfortable button-operated gear shifting mechanism is suggested as a solution to these drawbacks. By substituting easily accessible buttons for manual levers, this technology streamlines gear control, lessens driver fatigue, and improves operational convenience. The technology automates the gear shifting process by combining electronics, microcontrollers, and actuators, guaranteeing a faster reaction time, more comfort, and increased usability. As a result of the gear design improvement, the gear shifting also became quieter and smoother.

It is crucial for compact cars and bikes that the gear shifting system be simple to operate and manage. Certain drivers could find it difficult to change gears in stressful situations, such as congested roads, hilly terrain, or an abrupt speed limiter that makes them extremely nervous. The proper gear ratio must be chosen in these circumstances, or else the engine may shut off or may cause.

II. EXPERIMENTAL PROCEDURE

The experimental process for the ergonomic and effective button-operated gear shifting system combines mechanical actuation and electronic control to produce seamless and intuitive gearchanges. Choosing the right parts is the first step in the process. These include push buttons for gear input, a microcontroller (such an Arduino) for control logic, and a DC servo motor or linear actuator for the actual gear shift. Following component selection, the control circuit is built and configured to react to button presses for gear up and gear down. The gear lever is moved to the required position by the microprocessor, which decodes the signals and activates the motor accordingly.

The gear shifting operation can be precisely controlled by means of a linkage or mounting bracket that mechanically connects the actuator to the gear mechanism. Limit switches or gear position sensors can be added as an optional feature to offer real-time feedback, guarantee precise gear engagement, and prevent missed shifts. The system is thoroughly tested to adjust the timing, alignment, and control logic following hardware integration. With an emphasis on ergonomics, responsiveness, and safety, numerous tests are carried out to verify performance in both static and dynamic environments. The system's effectiveness, decreased physical strain, and user convenience are confirmed by the final test, which contrasts its performance with that of conventional gear shifting.

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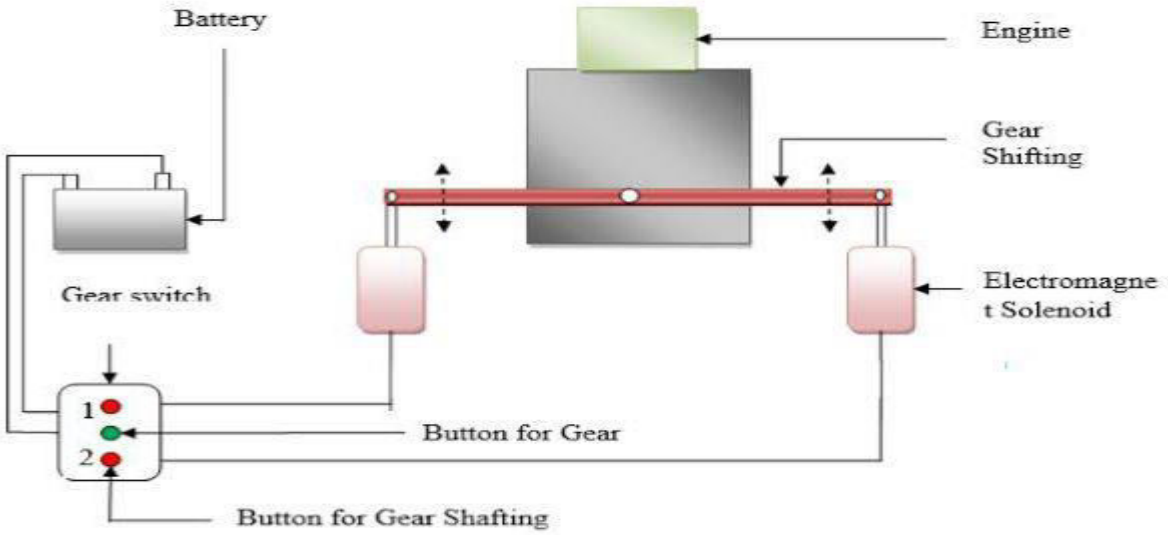
III. MATERIALS

Ergonomic and Efficient Button Operated Gear Shifting System requires a combination of mechanical, electrical, and electronic materials to ensure smooth and reliable gear operation. Mechanically, it involves a gear shifting mechanism connected to an actuator either linear or rotary that performs the physical task of changing gears. Mounting brackets, return springs, linkage arms or cables, and an ergonomic enclosure for housing the buttons are also essential for seamless integration into the vehicle's frame. Electrically, push buttons or tactile switches are used by the rider to command gear changes. These are connected to a microcontroller, such as an Arduino, which processes the input and controls a motor driver or relay module to power a DC, servo, or stepper motor that performs the gear shift. Limit switches or position sensors may be included to ensure accuracy and prevent over-travel. A 12V DC power supply or battery is used to power the entire system. For feedback and monitoring, LED indicators or an optional LCD display can be included to show current gear status. The system is developed and tested using tools like soldering kits, a multimeter for circuit verification, and programming platforms like the Arduino IDE for uploading control logic. The entire setup aims to reduce manual effort, improve rider comfort, and provide a modern alternative to traditional mechanical gear levers.

BLOCK DIAGRAM



IV. LITERATURE SURVEY

Vehicles with manual transmissions and two-wheelers in particular rely mostly on lever-based gear shifting devices, which demand a great deal of physical exertion, foot-eye coordination, and driver focus. In addition to being ergonomically problematic, these manual systems decrease driving comfort and efficiency, especially in situations with heavy traffic. Button-operated gear changing systems have become a contemporary approach to enhance system performance and user experience as a result of mechatronic advancements. Numerous studies have looked into automating gear shifting using button presses by integrating microcontrollers like Arduino and PIC with actuators. Such systems can greatly minimize driver fatigue and enhance responsiveness by doing away with the requirement for mechanical levers, as research by Mohan et al. (2018) and Kumar & Rao (2020) shows. Designing such systems requires careful consideration of ergonomics.

Vehicle ergonomics research highlights that putting gear change controls in convenient places improves user comfort and lessens strain during extended use, as demonstrated by the work of Garg & Chauhan (2019). Researchers are arguing that gear position sensors and fail-safe logic should be included in order to prevent improper shifting and mechanical damage, highlighting the importance of safety concerns. According to SAE technical papers, these technologies also greatly benefit people with disabilities by making vehicle control safer and easier for them. Overall, research suggests that button-operated gear shifting systems offer a viable, ergonomic, and effective substitute for

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conventional mechanisms; nevertheless, further work is required to improve aspects like affordability, dependability, and real-time response.

V. PROPOSED SYSTEM

It is designed to replace the conventional manual gear shifting mechanism with a more user-friendly, electronically controlled setup. Instead of using a mechanical lever, the system utilizes ergonomically placed push buttons to initiate gear changes, making it easier and more comfortable for the rider or driver, especially in congested traffic or long-distance travel. These buttons are connected to a microcontroller-based control unit that interprets the input signals and commands an electromechanical actuator such as a DC or stepper motor to shift the gears accordingly. To ensure accuracy and safety, the system incorporates position sensors that provide real-time feedback to the microcontroller about the current gear position. This feedback loop prevents gear skipping and ensures smooth transitions. Powered by the vehicle's battery, the system includes protective measures like over-current protection and manual override in case of failure. Overall, this button-operated gear shifting system enhances operational efficiency, reduces rider fatigue, and promotes a safer and more comfortable driving experience.

VI. RESULTS AND DISCUSSION

The electro-magnets' application ensures smooth operation. Since the electro-magnets are reasonably priced, they may be installed in any two-wheeler and are particularly helpful for women and those with physical disabilities. This design can be altered and refined in accordance with the applications by employing additional techniques. The mechanism's impact on engine performance was examined in the current study, and further strategies were employed to adapt the mechanism to our needs and applications.

VII. CONCLUSION

A great deal of practical information about planning, buying, assembling, and machining has been gained from working in this field. Smooth operation results from the use of an electro-magnetic coil. Button-operated electro-magnetic gear shifting systems are highly expensive initially, but they are very helpful for two-wheelers, automobile owners, and auto shops.

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