



“Design And Fabrication Of Hill Assistant System”

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Abstract:

In the hill station, the most common problem to the drivers is to park their cars in the slope and to start up the car. While waiting in the traffic, the cars have to move on step by step very slowly, this situation is a difficult one for the drivers to make their car not to roll back in the slope. So, the mechanism has to be developed to stop the vehicle from rolling back and it should not stop the vehicle in accelerating forwards. This function can be achieved by using the ratchet and pawl mechanism. We also used a pneumatic cylinder which is useful when we wanted to drive in reverse direction. The 3D model will be drawn with the help of CATIA software. The parts of the system are manufactured and then assembled together. After making the assembly, the experimental testing will be carried out and then the result and conclusion will be drawn.

I. INTRODUCTION

It's a situation that every driver is familiar with. You're driving your car up a hill and at the top of the incline is an intersection with a traffic light. The light is red and there are already two or three cars stopped in front of you. You ease down on the brake pedal and come to a stop behind them. Soon, another car pulls up just a few feet behind you. As the light turns green, you release the brake. If you're driving a manual transmission, you step on the clutch with your left foot and move your right foot to the accelerator pedal. At this point there's nothing stopping your car from rolling backward except the braking force of the engine, and if you're using a clutch even that force is gone. Gravity starts pulling you back down the hill, straight toward the bumper of the car behind you. What do you do? Do you panic and hit the brake? Do you let your car drift into the next car in line? Well, probably not. If you've been driving for any length of time, your reflexes take over. You simply step on the accelerator and gradually bring the engine up to speed. If you're driving a manual transmission, you press the accelerator as you simultaneously let up on the clutch. The car moves forward. Disaster averted!

This situation is so familiar that there's a good chance you probably don't even think about it much anymore. Yet somewhere in the back of your mind you may still feel a little uneasy at the first sign of your car rolling backward. Maybe there was a time in the past, when you were fairly new to driving, that you didn't get the car moving forward soon enough and you wound up in a little fender bender. And if you drive an SUV, a truck or a car towing a heavy load, the situation can be far worse. A heavy vehicle moving backward down a hill is difficult to accelerate, not to mention a significant danger to the vehicles behind it. Wouldn't it be nice, in this age of computerized driving safety gadgets, if someone could come up with a way to prevent this sort of situation from happening before the driver even has to think about it? Well, someone has. It's called hill-start control, hill-start assist or simply hill holder, and there's a good chance that it's available at an automobile dealer near you. It's a great addition to the bevy of electronic safety and regulatory devices that keep you driving safely.

The present invention comprises an improved release mechanism for a hill holder device, the hill holder device being either a mechanical brake control device or a braking assistance servo-motor system, each being operable to maintain the brake pedal in the applied position under certain predetermined circumstances.

In a vehicle having a clutch pedal and a brake pedal, a hill holder device is utilized to maintain the brake pedal in the applied position so that the vehicle operator's foot is free to operate the accelerator pedal. A mechanical brake control device may be disposed between the clutch and brake pedals, with the clutch pedal connected by a linkage to the brake control device so that release of the clutch pedal will cause deactivation of the brake control device and result in release of the brake pedal from the applied position. A braking assistance servo-motor system operates to maintain the brake in the applied position wherein a control circuit has a clutch switch operable responsively to clutch pedal position to provide input to the control circuit and effect the actuation or deactivation of valve means coupled to the booster mechanism. Again, a change in clutch pedal position, along with other parameters, is utilized to effect actuation or deactivation of the booster and either maintain or release the brakes from the applied position. It is desirable to provide a release mechanism that will affect release of the brakes at the exact moment when the vehicle drive train applies adequate torque to move the vehicle along the inclined surface. The release mechanism should be usable with either a mechanical brake control device or a braking assistance servo-motor system.

The present invention provides a wheel braking torque sensor disposed within a wheel brake so that when the vehicle is accelerated and effects corresponding wheel braking torque changes within the brake, the change in torque is sensed and provides an input to either a solenoid connected with the mechanical brake control device or to the control circuit connected to the braking assistance servo-motor in order to effect operatively a release of the brakes from the applied position to a released position and permit movement of the vehicle.

The invention provides an improved release mechanism for mechanical brake control device in a vehicle having a brake pedal and a clutch pedal, the brake pedal being movable from a rest position to an applied position during braking, the clutch pedal being movable from a rest position to an applied position when the associated clutch assembly is disengaged, the mechanical brake control device being operatively connected with the brake pedal for actuation thereby and including means for opposing movement of the brake pedal away from the applied position in order to retain the brake pedal in said applied position, and a release mechanism operatively coupled with said brake control device for effecting operation of the brake control device and a subsequent release of the brake pedal from the applied position, wherein the release mechanism comprises braking torque sensor means for sensing a change in braking wheel torque when the vehicle begins movement and effects a change in the braking torque, and actuation means coupled to the brake control device and responsive to said sensor means in order to effect release of the brake pedal from the applied position. The invention provides an improved release mechanism for a braking assistance servo-motor system in a vehicle having a brake pedal/clutch pedal, where in the system is operable to maintain the braking of the vehicle when the brake pedal is released toward an inactive braking position and the system comprises a brake booster including output means for operatively actuating the brakes of the vehicle, valve means operatively connected with the booster, and control circuit means for sensing vehicular parameters and operatively connected to the valve means, the brake booster operating responsively to the brake pedal by utilizing a pressure differential to displace the output means and actuate the brakes, the control circuit means sensing the parameters of the vehicular attitude and vehicular speed to actuate responsively thereto the valve means and provide fluid pressure to the brake booster and maintain displacement of the output means and actuation of the brakes after the brake pedal has been released, wherein the release mechanism comprises sensor means disposed within the wheel brake and for sensing a change in wheel braking torque when the vehicle commences movement so that the sensor means transmits a signal to the control circuit means to cause operative deactivation of the valve means and permit said brake pedal to be released toward an inactive braking position.

II. OBJECTIVE

The main objectives of the system are:

- To overcome problem of sliding in reverse direction of a vehicle while on hill or any inclined surface.
- To replace the electrical component in design of hill assist braking system by ratchet & pawl for cost optimization.

III. PROBLEM STATEMENT

In the hill station, the most common problem to the drivers is to park their cars in the slope and to start up the car. While waiting in the traffic, the cars have to move on step by step very slowly; this situation is a difficult one for the drivers to make their car not to roll back in the slope. So, the mechanism has to be developed to stop the vehicle from rolling back and it should not stop the vehicle in accelerating forwards.

EXPERIMENTAL DETAILS

(1) Ratchet And Pawl Mechanism

A ratchet is a mechanical device that allows continuous linear or rotary motion in only one direction while preventing motion in the opposite direction. Ratchets are widely used in machinery and tools.

A ratchet consists of a round gear or linear rack with teeth, and a pivoting, spring-loaded finger called a pawl that engages the teeth. The teeth are uniform but asymmetrical, with each tooth having a moderate slope on one edge and a much steeper slope on the other edge.

When the teeth are moving in the unrestricted (i.e., forward) direction, the pawl easily slides up and over the gently sloped edges of the teeth, with a spring forcing it into the depression between the teeth as it passes the tip of each tooth. When the teeth move in the opposite (backward) direction, however, the pawl will catch against the steeply sloped edge of the first tooth it encounters, thereby locking it against the tooth and preventing any further motion in that direction.

Pawl is a mechanical component in a ratchet. A part of the adjustable height locking mechanism of an extension ladder. Pawl is A part of a table saw splitter, a safety mechanism designed to prevent kickback

(2) Pneumatic Cylinder Double Acting 25 MM bore X 50 MM Stroke Profile Type - Both Ends Cushioned With Magnetic Piston, Dcp series - iso 6431

A pneumatic cylinder is a mechanical device that converts compressed air energy into a reciprocating linear motion. A double-acting cylinder uses compressed air to move a piston in and out, while a single-acting cylinder uses compressed air for one-way movement and a return spring for the other.

Double-acting pneumatic cylinder

Double-acting pneumatic cylinders are the most common type since they give the user complete control of the piston movement. Figure 3 shows how the piston and piston rod move when compressed air enters the cap-end port and the rod-end port. A negative position is when the piston rod is retracted, and a positive position is when the piston rod is extended. When compressed air enters the cap-end port, it pushes the piston forward (positively), extending the piston rod (shown in Figure 3 A). Air is forced out of the rod-end port. To retract the piston rod, compressed air enters the rod-end port, forcing air out of the cap-end port, and forcing the piston to retract to the negative position

(3) Aeroflex 1/4 inch 5/2 Single Solenoid Valve, V4-08 :

Aeroflex 1/4 inch 5/2 Single Solenoid Valve, V4-08 is a premium quality product from Aeroflex. Moglix is a well-known ecommerce platform for qualitative range of [Pneumatic Solenoid Valve](#). All Aeroflex 1/4 inch 5/2 Single Solenoid Valve, V4-08 are manufactured by using quality assured material and advanced techniques, which make them up to the standard in this highly challenging field.

(4) Arduinio Uno

Nowadays, with Microcontrollers being relatively cheap and readily available in the market, making a purchase decision on a suitable one to pick might a hard task to handle. However, there's one particular model that's good to start with for users. That model is the ATmega328p, an 8-bit AVR microcontroller.

ATmega328P is a high performance yet low power consumption 8-bit AVR microcontroller that's able to achieve the most single clock cycle execution of 131 powerful instructions thanks to its advanced RISC architecture. It can commonly be found as a processor in Arduino boards such as Arduino Fio and Arduino Uno.

(5) MPU 6050 Gyroscope

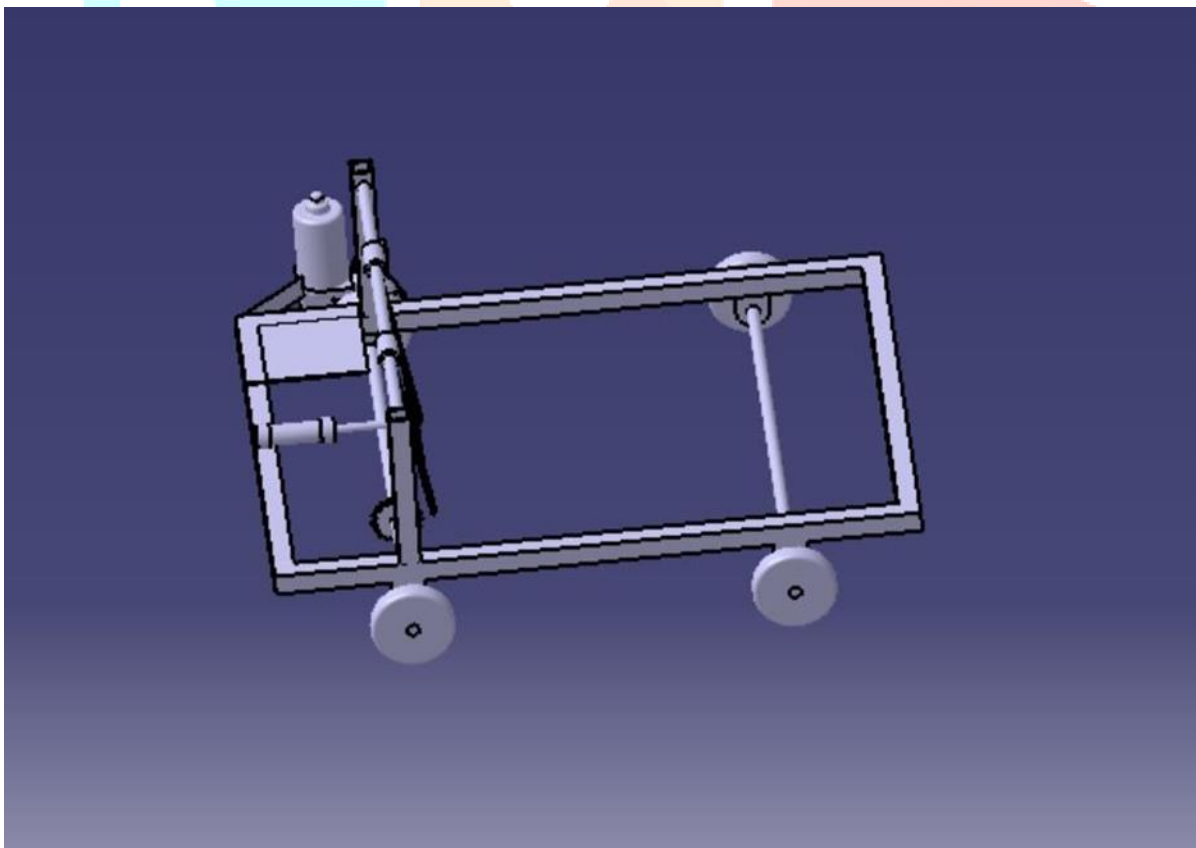
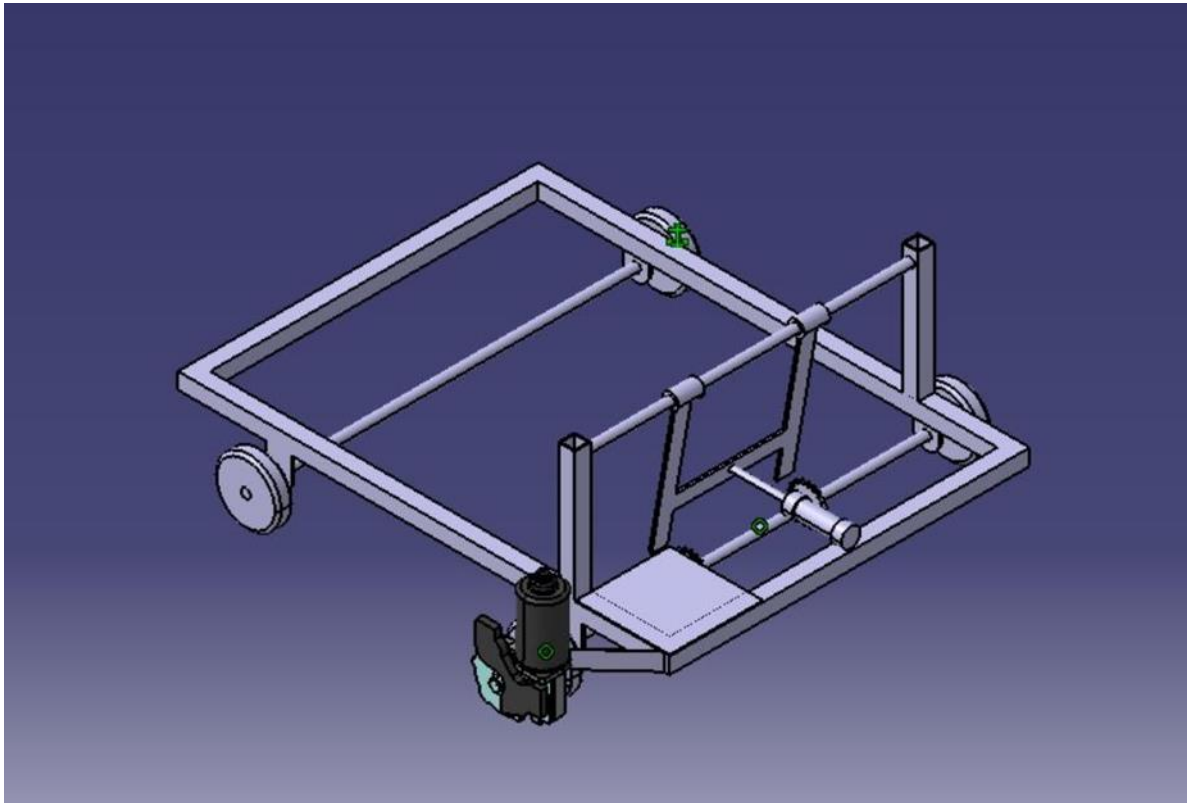
The gyroscope measures rotational velocity (rad/s). This is the change of the angular position over time along the X, Y, and Z-axis (roll, pitch, and yaw). This allows us to determine the orientation of an object.

MPU-6050 is an 8 pin 6 axis gyro and accelerometer in a single chip. This module works on I2C serial communication by default but it can be configured for SPI interface by configuring its register. For I2C this has SDA and SCL lines. Almost all the pins are multifunctioning but here we are proceeding only with I2C mode pins.

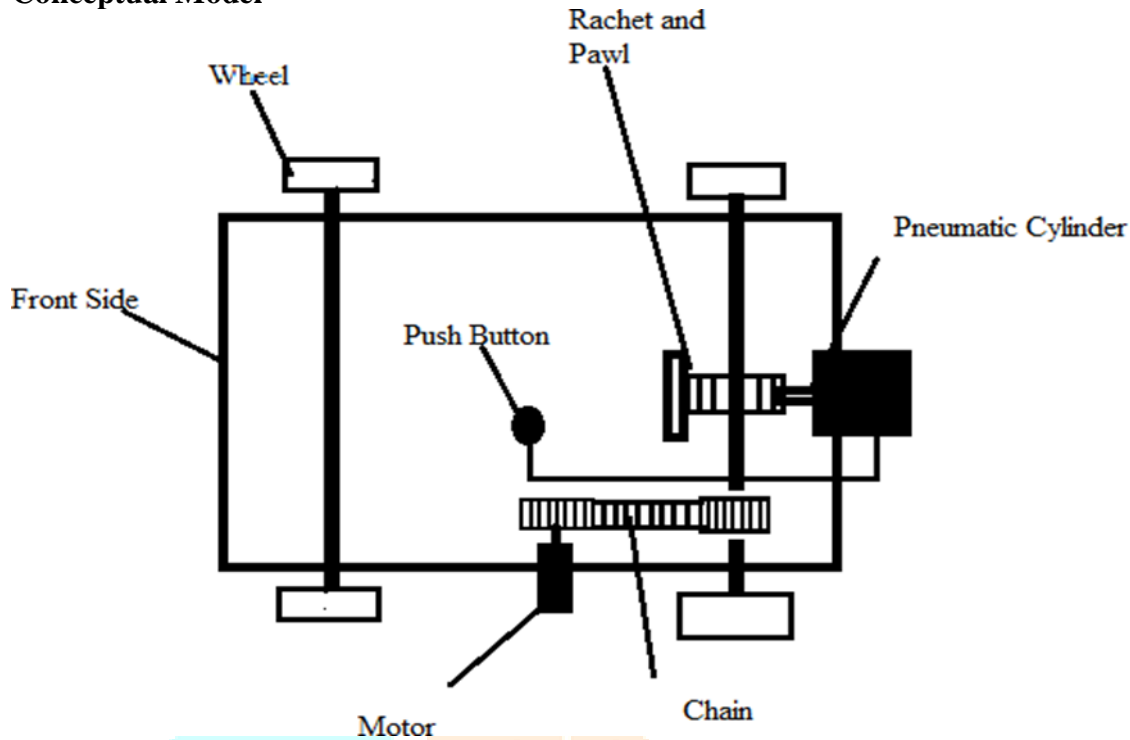
METHODOLOGY

- We started our work with a literature survey.
- Search many research papers from various articles and published journal papers.
- Worked on diff. Mechanisms that can be useful for our project.
- We have done a rough 2D sketch of model in Auto-CAD.
- After getting rough model we started calculation of some components.
 - We selected standard components.
- Actual preparation of project:
 - We will complete calculations of remaining parts.
 - We will purchase standard components from market.
 - We will be done a rough 3D model of our project.
 - Manufacturing will be done.
 - Assembly will be done.
 - Testing of set up will be done.
 - Representation of actual theoretical report.

CAD MODEL



Conceptual Model



CONCLUSION

- The car will not move back when the vehicle is waiting at the hill station. So this will reduce the problem of sliding in the reverse direction of a vehicle while on a hill or any inclined surface.

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