

## Design of Combined Brake and Accelerator Pedal

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**Abstract** - This project consist of pedal which can provide both accelerating and braking function. The main objective behind this project is to reduce the accident occurred due to misapplication of accelerating pedal instead of brake pedal & also to reduce the time required to transferring foot from accelerating pedal to brake pedal. This pedal is designed in such way that it can be used for any vehicle which may be light duty or heavy duty vehicle. The mechanism is very simple and it is very easy to manufacture. Its simplicity will help any driver to adopt this new mechanism easily. Today's car are provided with three separate pedals for braking, clutch and accelerator. As accelerator and brake pedal both are operated by right foot; it is necessary to lift the foot from one pedal to operate another pedal. This leads to a problem that some drivers fails to move there foot from accelerator to brake pedal in emergency condition. Which can become cause for accident. Also it takes some time to move the foot when switching between two pedals.. First we designed this pedal is from "CATIA V5" and then the actual prototype is made & tested for its working. This will give new design of combined brake and accelerating pedal mechanism.

**Key Words:** Acceleration1, Brake2, Accident3, Combined4, CATIA V55 etc.

### 1. INTRODUCTION

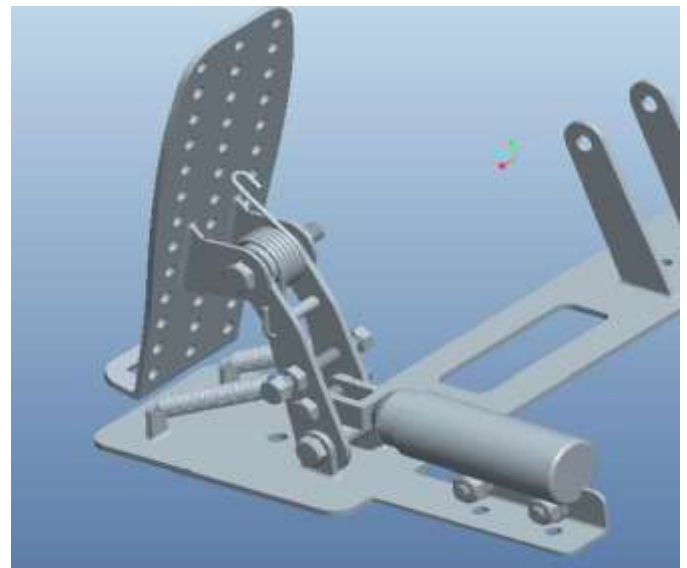
At present during driving the car the foot of driver is always at a distance from the brake & continuously placed on accelerator pedal. If we make pedal that works both as an accelerating as well as braking pedal and it can save lives and reduce accidents. This design is consists of a joint pedal control for operating the braking and the acceleration, arranged in such that the two different motions does not interfere with each other. Both the accelerator and brake can be operated in less time with no error.

### 2. METHODOLOGY

In this design of our pedal system; we can apply brake instantaneously also it help to permit acceleration with same foot. Also both the motions are kept distinct from each other and they do not interfere. In this project we first made rough designs by pencil to get a basic idea of operation of this system. After that we finalized one design and made 3D modeling on software CATIA V5 as shown in

fig. To ensure the working of this project we made a frame of cross-section 1070\*700 mm of material mild steel with 2mm thickness square cross section. At the front end of frame we welded motor & at back side of frame, seat mounting area. The motor will start and stop with the help of combine accelerator and brake pedal. Also we used hydraulic braking system to showcase the function of braking. The arrangement of pedal consist of two pivot points. First pivot point is used for acceleration of motor by stretching of acceleration cable. Second pivot point is used for applying brake when pedal is pressed by whole foot brake is applied by forward movement of rod piston arrangement in master cylinder. On shaft of motor brake disc is provided to stop the rotation of motor. When whole foot is moved forward/presses brake is applied while for acceleration force is applied from the toe of the foot. For return movement of pedal torsion spring is provided.

### 3. DESIGN

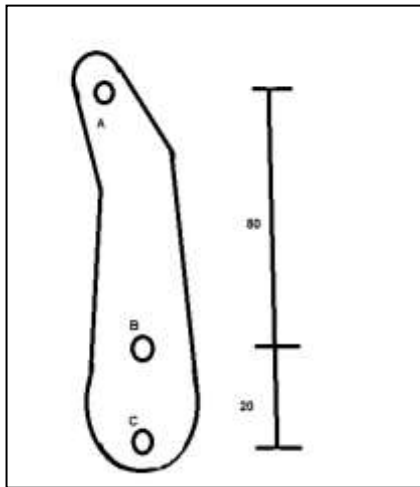


#### 3.1 Pedal ratio for brake pedal

For getting proper braking actuating force important part is to maintain pedal ratio. For brake pedal we kept as 5:1. As per our comfort we take pedal height 100 mm.

Pedal Ratio- distance C-A/distance C-B

For kept pedal ratio 5:1 we taken distance between each point as shown in figure.

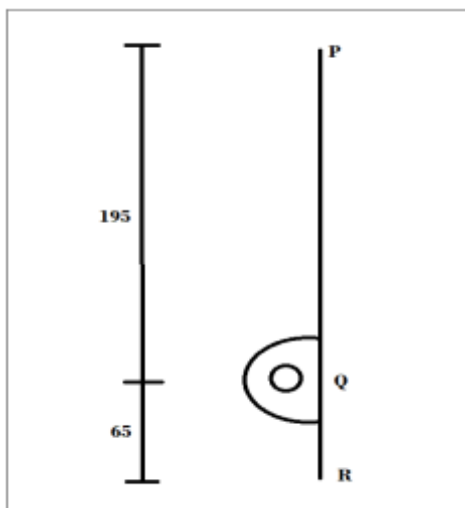


### 3.2 Pedal ratio for acceleration pedal

As we are going to operate throttle by using accelerator cable. Generally for full throttle opening maximum linear motion of accelerator is up to 1 inch. So we have to design accelerator pedal such that 1 inch linear motion should be done. For actuate pedal very less efforts should require, we take pedal ratio 3:1. For complete rest foot on pedal length should minimum 10 inch.

$$\text{Pedal ratio} = \frac{\text{distance P-Q}}{\text{distance Q-R}}$$

For kept pedal ratio 3:1 we taken distance between each point is as per below fig.



### 4.WORKING MECHANISM

The combined brake and accelerator pedal consist of single pedal which is pivotally mounted on the lever. The other end of lever is pivotally mounted on the floor of the vehicle. The pedal is supplied with torsion spring whereas

lever is connected with helical spring to keep them into to original position when no force is acting on them.

#### 4.1 Acceleration

The vehicle can be accelerated by rotating the pedal about the upper pivot point. This is achieved by connecting accelerator cable at the bottom of the pedal near the heel rest. When the force is applied at the upper portion of the pedal it rotates and stretches the accelerator cable. At this time the lever is kept stationary by the helical spring connected to it. On releasing the pedal it comes to original position because of torsion spring.



#### 4.2 Braking

The brakes of the vehicle is applied by imparting forward motion to the pedal. The forward push will release the pressure applied for acceleration and only move the lever which is pivotally connected to floor. Hence the risk of acceleration while braking is avoided. This forward motion of lever will be used for the braking circuit. The helical spring will bring back the lever to its original position.



### 5. TESTING AND RESULTS

1. It takes longer to brake in an emergency with separate pedals. It takes at least 0.5 to 1 second to move your foot from one pedal to the other and at 80 kilometers per hour this adds 5 to 10 meters to your stopping distance. With our designed combined pedal this time of shifting the

pedal is totally eliminated so driver can immediately apply brakes.

2. Another problem with separate pedals is that it's there is possibility of hitting the wrong pedal, this problem is also solved.

3. Now while starting vehicle on hill, driver uses handbrake sometimes to restrict vehicle from coming down the hill. By using this combined pedal arrangement the use of handbrake is greatly reduced also it becomes much easier to pick up from rest on hill having positive slope.

## 5. CONCLUSION

With above study we can conclude that this new mechanism result in avoiding interference of braking during acceleration and vice versa. Moreover it is advantageous over conventional pedals. This combined pedal mechanism thus provide a driving control which permits the quick and smooth transition from acceleration to braking, without needing to transfer the foot from one pedal to another. The rapid increase in increase in no of vehicles on roads day by day, demands an exploration of such mechanism to get rid of driver's effort and reduce road accidents.

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## BIOGRAPHIES



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