# Design and Fabrication of combine Brake and accelerator Pedal

**Stifan Pinto[1], AdinathKelwalkar[2], PranavPatil[3] , ShashankSawant[4], Prof.NitinGhotkhidikar[5]**
[1, 2, 3, 4, 5] Dept of Mechanical Engineering
[1, 2] S.S.P.M college of Engineering Kankavli

***Abstract-*** *The driving involves continuous use of brake accelerator and pedal. Most of the novice as well as difficult drivers find it hectic to manage all the three at a time. In majority of the cases people have the bad habit of applying the brakes during accelerating itself, which results in early damage of clutch plates and heavy maintenance of cars. In addition to this the increased road accidents show the peoples inability to quickly apply brakes by shifting their foot from accelerator to brake. To overcome this, the project proposes the concept of combined accelerator and brake pedal in automobiles. The proposed consists of a combined accelerator and brake pedal which is fabricated in such a way that the single pedal can be used for acceleration as well as brake just by operating in different directions. The proposed concept is expected to solve the problem of shifting the foot regularly on brakes and accelerator as well as adverse effects on vehicle clutch systems as the accelerator gets completely minimum during braking automatically.*

***Keywords***- increased road accidents, single pedal, sifting the foot.

## I. INTRODUCTION

Over the years, designers have developed various combined brake–accelerator pedals in an effort to eliminate the operator's risk of pressing the wrong pedal as well as to reduce his or her reaction time in braking. Driving an auto is a complex and demanding task, involving the highest stakes of life, limb and money. Yet, almost everybody thinks that he is able to drive, and, in fact, 96 million persons in this country are licensed to do so. Even those who cringe in terror at the sound of a home bench saw will slide under the steering wheel and pull into the onrushing traffic with aplomb - often without looking to see if the way is clear. The statistics of the rate of accidents on an American road in a car show that a traffic death occurs every ten minutes and an injury every nineteen seconds. The automotive death rate is over 50,000 per year; this can be dramatized as "In 1966, 10 times more deaths than Vietnam or 500,000 deaths since 1954." For every death there are many injuries; in 1966, there were more than 50,000 deaths and over 190,000 injuries. In addition to the suffering and sorrow from death or injury, there is the dollar; $10 billion of them in 1966 (NSC, 1967).

One of the parameters which affects safety is the permissible margin of error. The greater this margin, the less the chance of an accident or less the severity of accident. This margin is dependent upon design. One parameter of the design is the time between the decision of the controller and the reaction of the machine. The quickness with, which, the driver can react to any situation is a very important factor in driving - especially at high speeds.

Although the traditional separate accelerator and brake pedals, which appeared at the same time as the model A Ford, are technically simple and functionally safe, they nevertheless embody two crucial drawbacks. First, the reaction time for a driver to move his or her foot from the accelerator to the brake is about 0.2 s; a vehicle traveling at 90 km/h moves 5 m during that time.

Second, there is the hazard of pressing the wrong pedal, i.e. a poor depression on the brake pedal or simply contacting the wrong pedal (e.g. pressing the accelerator rather than the brake pedal). At least in nearly all vehicles with an automatic transmission this latter type of error can result in 'unexpected acceleration,' a phenomenon that is conceptualized by the driver as being something wrong with the vehicle but is actually caused by the driver pressing fully on the accelerator, thinking he or she is pressing the brake pedal Increasing the difference in the level of the two pedals can reduce the risk of pressing the wrong pedal. This tactic, however, has a serious disadvantage in that it increases the operator's reaction time in braking. Attempts have also been made to solve the problem through different types of combined brake–accelerator pedals. For technical or ergonomic reasons, these attempts have not met with very much success. One reason for the failure is that some accelerator pedals must be released upward before braking can transpire. A new Swedish construction that is free of these shortcomings has proven to be of sufficient interest that the Swedish National Road Administration is supporting a systematic evaluation of the mechanism.

This project deals with concept of combined accelerator brake pedal to reduce the reaction time in which the person shifts his foot from accelerator to brake, thus reducing accidents.

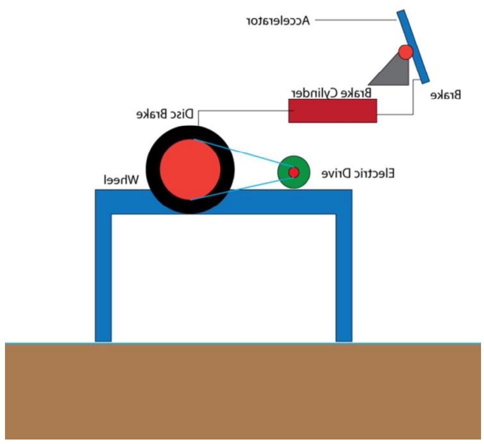
## II. LITERATURE REVIEW

Before starting the plan of the project, it is very important to study the current research work on related topic so that any current solutions, their advantages and disadvantages can be outlined.

Some formal studies on the man-machine aspects of a foot pedal have been advanced by Trumbo and Schneider (1963), and McCormick (1964). Their main consideration was the reaction movement time during the continuous operation of different types of pedals, i.e. the subjects were told to depress and release the pedal as many times as they could during an interval of three to four minutes. Obviously this is not the type of action one may be expected to perform while driving an automobile, but, as a useful and common result of these experiments, it was found the most effective and least fatiguing pedal design placed the fulcrum under the heel, as opposed to a fulcrum at the top or in the middle. Ayoub and Tromhley (1967) used reaction time to a visual stimulus and a time of travel to a fixed stop. The optimal position for the fulcrum, with the load attached at the ball of the foot, is at the heel because it results in the minimum time of motion. This result was in agreement with the findings of Trumbo and Schneider (1963). They also recommended that the optimal foot-tibia angle should be from 78 to 96 degrees; however, 84 degrees is the preferred angle. This was predicated on the femur being horizontal, to reduce the constriction of blood flow by the edge of the operator's chair. Versace (1966) at the Human Factors Department at the Ford Motor Company conducted some preliminary studies of dual brakeaccelerator devices on automobiles but failed to show any "unusual advantage" over the conventional two pedal system. One type of "one-pedal control" of a car has been developed by Humphrey, Inc., (1968). In this method, various degrees of braking are accomplished by simply letting up on the accelerator pedal. In this system, three distinct braking zones are provided: an upper proportional braking zone, a middle neutral or coasting zone, and a lower acceleration Zone. However, this design has the limitation that the driver has to keep his foot constantly on the pedal. If, due to fatigue or some other reason, he removes his foot from the pedal, the car will come to a panic stop. Several designs of dual action brake pedal mechanisms have been resting in the files of the United States Patent Office since the early twenties, but, to the author'sknowledge, no experimental evaluation of reaction times has been done on dual - pedal systems except at Kansas State University. To explore the potentials of a dual pedal on automobiles, a series of six experiments was conducted at Kansas State University. The first three of these experiments have been described in detail by Konz and Daccarrett (1967). The next three experiments are described in detail by Kalra (1968).

## III. WORKING PRINCIPLE

The figure below shows the conceptual diagram of the project.



.As shown in the figure the entire concept is demonstrated on a frame. The frame consists of wheel of the automobile and an electric drive train. The combo accelerator brake pedal is fabricated and one side of it connected to the accelerator and one to the brake. When the pedal is pressed in forward direction the accelerator gets activated and the wheel accelerated. When the same pedal is pressed in reverse direction, the brakes gets activated and braking action is implemented. Thus this can save accidents due to delay in reaction time due to shifting of foot from accelerator to brake during emergency

## IV. DESIGN CONSIDERATION

Power of Shaft P= 17 watt

1] Power transmitted by shaft,

$$P = (2\pi NT)/60$$

Where, N =RPM of motor shaft = 24

T =Torque Transmitted

$$17 = [(2 \pi \times 24 \times T) / 60] \times 10^3$$

$$T = 6.67 \times 10^3 \text{ N-mm}$$

We know that,

No. of teeth (Gear), N1 = 14

No. of teeth (Sprocket), $N2 = 42$
Ratio = R = 1: 3
Torque on Sprocket = 3× T
= 3 × 6.76 × 10^3
= 20.280 × 10^3 N-mm

2] Diameter of Sprocket,

Periphery = π × Dia.Of Sprocket

Inputs: chain pitch = 0.520
No. of sprocket teeth= 42
Now,
Chain pitch × no of sprocket teeth = π × Dia.Of Sprocket

Dia. Of sprocket = (0.520 ×42)/ 3.14
Dia. Of sprocket = 6.95 inch

3] Torque Transmitted,
T = Force × Radius
20.280 × 10^3 = F × 88.625
F = 229.76 N
F = 229.76 /9.81
F = 23.3 KG

4] Torque transmitted by the shaft:

$T=\pi/16 \times \tau \times d3$

From data design handbook permissible shear stress for commercial steel shaft without allowance for keyway= $\tau$=55Mpa

Therefore d=12.266 mm

Taking factor of safety as 1.5
D=12.266 x 1.5
=18.399

From data design handbook the standard shaft size is 20 mm
Therefore, D=20 mm

For 20 mm shaft the required pedestal bearing is P 204

## V. CONCLUSIONS

The mechanism results in avoiding confusion of braking during acceleration andvice versa. The tremendous increase in number of vehicles on roads day by day, demands an exploration of suchmechanism to get rid of driver's effort and reduce road accidents. This innovative project will be useful for physically challenged person in future.

## VI. ACKNOWLEDGMENT

We would like to express our special thanks of gratitude to Mr.NitinGhotkhidikarSir who gave us the golden opportunity to do this wonderful project on the topic Design and Fabrication of combine brake and accelerator pedal ,which also helped us in doing a lot of Research and we came to know about lot of things. We really thankful to them.

Secondly we would like to thanks our parents and friends who helped us a lot in finalizing this project within a limited time frame.

## REFERENCES

[1] Ayoub, M. M., and Trombley, D. J., 1967, Experimental determination of an optimal foot pedal design, Journal of Industrial Engineering, 18, 9, 550-599.
[2] Box, G. E. P., and Hunter, J. S., 1959, Condensed calculations for evolutionary operations programs, Technometrics, i, i, 77-95.
[3] Greenshields, B., 1936, Reaction time in automobile driving, Journal of Applied Psychology, 20, 6, 353-58.
[4] Henry, F. M., 1961, Stimulus complexity, movement complexity, age and sex in relation to reaction latency and speed in limb movements, Research Quarterly, 32, 353-366.
[5] Konz, S. and Daccarrett, J., 1967, Controls for automotive brakes, Highway Research Record Number 195, Highway Research Board, Washington D.C.
[6] Kalra, G., 1968, Optimizing the Design of a Dual Function Brake Accelerator Pedal. M. S. Report, Kansas State University.
[7] Kramer, M. D., 1949, The motor-vehicle driver: His nature and improvement (cited Mihevc, D., 1965).