Automatic Emergency Braking System


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Abstract-- Nowadays the vehicles are equipped with various safety systems for reducing the accident risks. Those systems are antilock braking systems (ABS), Stability control and traction control. These safety systems are used the various types of sensors for monitoring the condition of the automobile vehicles in emergency conditions.

This concept of automatic emergency braking system consists of the mechatronic system having ultrasonic wave emitter which is placed at front side of a vehicle which produces and emits the ultrasonic waves in forward direction in a set distance. So this system is used for avoiding the accidents of vehicles which becomes more nowadays.

Keywords-- AEBS, Sensor, Pneumatic system

I. INTRODUCTION

In any mechanical system brakes are used for stopping or for slow down the machine, car etc.

When car is in running condition it possesses high amount of kinetic energy. Then we want to stop the running car there is a need of decreasing the speed of running car so that its kinetic energy can be minimised.

When we apply the brakes of car its kinetic energy is converted into heat energy and thus vehicle stops.

The AEBS system basically works on ABS system principle. When sudden collision is identified AEBS automatically apply the brakes for preventing collision of car and obstacle and thus to damage the car. When the driver is driving a car on a road at that time if he see sudden obstacle in front of his car at this emergency situation he fails to apply the brakes due to his mind set as he is frightened. So there may be chance of accident.

So AEBS prevents the emergency condition and apply brakes automatically by sensing the obstacle with the help of sensor and mechatronic control unit. Hence vehicle stops before its collision on an obstacle.

II. LITERATURE SURVEY

Brakes are essential components of vehicles. So right from automobile invention brakes are the integrated part of the automobile. New invention in the design of brakes was always took place. In earlier days in 1902 disc brakes were used till 1950’s this system had more disadvantages so it did not get much more success.

In 1918 Malcom Laughead invented the four wheeler hydraulic brakes. So the mechanical system of braking was replaced by hydraulic system which overcomes the disadvantages of the mechanical system. In 1918 this system was used at first time in many cars.

Later on anti lock braking system technology arises. This technology firstly used in aircrafts from 1950. It was used in racing cars in 1960. In 1969 famous automobile company ‘FORD’ used the ABS technology in its cars. Luxury Thunderbird was first vehicle which is equipped with ABS system. In these days we see ABS system in many vehicles. In ABS wheels are not locked hence driver is able to steering so the car can be controlled.

III. CONSTRUCTION AND WORKING

Any basic braking system uses the following component like,
1. Brake pedal and linkages
2. Power assist system
3. Master cylinder, hoses etc.
4. Brake rotor and pads
5. Brake drum and shoes
6. Brake pressure and warning systems
7. Parking brake pedal and linkages

Apart from these basic components AEBS uses the components like,
1. Proximity valve
2. Solenoid valve

IV. DESIGN CONSIDERATIONS

Introduction to Pneumatics

The pneumatics is the study and function of compressed air. Pneumatics is used in for a various manufacturing processes. Pneumatic equipment’s are used for many reasons. As air is a freely available, non-explosive, system is clean, also simple and controlled easily. So pneumatic system is widely used.

Pneumatic Components-

1. Compressor

Its main function is to compress the air at high pressure.
2. **Regulator**
   Pressure regulator is used to supply air at constant pressure.

3. **Pressure Sensor**
   It is used for detecting the pressure in pneumatic system.

4. **Direction Control Valve**
   Direction control valves are used for diverting the compressed air to pneumatic system.

   *Direction control valves are of following types-*
   i. 1/2 DCV
   ii. 3/2 DCV
   iii. 3/3 DCV
   iv. 3/3 DCV
   v. 4/2 DCV
   vi. 4/3 DCV
   vii. 5/2 DCV

   ![5/2 Direction Control Valve](image)

5. **Pneumatic Cylinders**
   The device which works on compressed air to produce a reciprocating motion.

   *Types of Pneumatic Cylinders-*
   1. Single acting cylinders
   2. Double acting cylinders
   3. Multistage cylinders

   When compressed air is supplied to the cylinder then air enters at one end of cylinder and thus piston is pushed to move and power is transmitted by piston to do the work.

   *Cylinders*
   - Force = Pressure × Area

   ![Single Acting Cylinder](image)

   ![Double Acting Cylinder](image)
Specification of Pneumatic Cylinders
1) Cylinder thrust.
2) Air consumption.
3) Piston velocity.
4) Type of mounting.
5) Couplings

6. Flow Controls
Flow control valves are used for regulating the flow of air in the system.

7. Fittings
Fittings contain basic components like seals, pneumatic hoses, tubes, etc.

8. Exhaust Valve
Used for release of pressure.

Basic working principle of braking system-
When car is running it posses the kinetic energy due to speed is dissipated into head energy due to the friction. The generated heat energy is given out in the air.

When the wheel of vehicle does not lock completely and rolled without slipping then brakes operate efficiently.

V. WORKING OF AEBS
Initially when we start the motor, shaft rotates so wheel connected to shaft also starts rotating when an object is placed in front of the metal sensors, the sensor senses it and metal sensor transmit the sound signal and receives the echo of that sound, from that signal is transmitted by sensor to the control panel and hence pneumatic cylinder is operated.

Thus pneumatic cylinder apply brake to wheel, that means if any vehicle come near to vehicle equipped with emergency braking system ultrasonic signal transmit signal (distance between vehicle and sensor) to the control panel and thus to stop the vehicle.

I. Advantages
1. The AEBS system is automatic.
2. The time required for actuation is less.
3. Design is simple.
4. It can be used in automobile vehicles and also in machineries for safety purpose.
5. It prevents the vehicles from accidents.

II. Applications
1. AEBS system is useful in vehicles.
2. It can be used in machineries for safety purpose.

VI. CONCLUSION
As in case of the AEBS is done with the help of the sensor, so it is quick in braking action by applying the brakes quickly in emergency situation. Hence using the AEBS the accidents are reduced. It leads to saving in many things like accident recovery cost, human life various damages also reduces the injuries by detecting any type of obstacle and preventing the collision of vehicle with the obstacle.

REFERENCES