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Automatic Reverse Breaking System for Trolley

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Abstract - Automation technology have provided us with various systems that reduces the time and human error.Vehicles, particularly four wheelers are very difficult to drive in the reverse direction. As personally one is very carefulabout, otherwise damage being caused to the vehicle. In view of this to provide a proper guidance to the vehicle in reverse direction, means are provided. Presently the vehicle has alarm system for maintaining the safe distance between vehicle and object while moving in reverse direction. When the vehicle gets too close to the object, the alarm istriggered this warns the driver about an object. But this feature has many problems and is prone to human error. Wehave enhanced the facility by using automatic braking when an obstacle is close by. Therefore, in this paperwe propose an "Automatic Reverse Braking system" to prevent collision by using sensors to detect obstacles. The"Automatic Reverse Braking system" will process the sensor data and control the vehicle to prevent accidents causedby careless driving or difficulty in detecting objects in reverse path. In this controlling logic is implemented on FPGAusing Xilinx software. The system designed by VHDL keeps a distance between the object and vehicle to prevent accidents.

Key Words: Brerаking System, Axis, Hydraulic Cylinder

1. INTRODUCTION

An automobile has been used to move human beings or as a carriers since the automobile was invented. Recently, the automobile is thought as daily necessasity because we spend much time with automobiles, such as we require it for emergency services, in factories, to carry loads etc. The use of electronic components in automobiles is set to accelerate and with ongoing efforts to improve safety and comfort, many approaches such as antilock brake systems, traction control systems, and electronic stability programs have been invented to achieve success in collision avoidance. The goal of vehicle safety ultimately is that a vehicle by no means collides, but it induces a large number of problems that we must solve. Collision, particularly for reversing collision due to careless or violent driving, is the most important major cause that leads to traffic accidents.

According to the National Highway Traffic Safety Administration, 8% of the accidents occur during driving in reverse. In traffic safety, obstacle detection and recognition play an important role in preventing reversing collision. The earlier an obstacle of a potential reversing collision is detected, the more chances there are available to protect passengers and other road users. Researches have been made on automatic braking systems, but we are introducing automatic brakes in reverse path. Therefore in this paper we propose a system which will help in enhancing the performance of vehicles moving in reverse and thus contributing to the upcoming automobiles technology. This system includes a novel technology to make vehicles safer and more efficient. The system is probably the most reliable means of detecting human beings and objects and, therefore, invaluable in the prevention of injury or fatal accidents. The aim of this paper is to develop an automatic braking system Our aim is to design the "Automatic Reverse Braking System" when the vehicle detects an obstacle in its reverse path using FPGA(Field Programmable Gate Array)which can avoid the accident in reversing the heavy loaded vehicles like trucks, buses and all the vehicles consisting of braking system.. If there is object in reverse path, the sensor senses the object and the break is applied automatically. In this, FPGA is used as a control unit to which the devices and sensors are interfaced. This system is suitable for commercial vehicles such as car, emergency services vehicles, trucks and buses. In this work the mechanism has been developed to stop the vehicle from rolling backwards when the vehicle is moving in the hill roads. Ratchet and Pawl mechanism has been identified to arrest the motion to the front axle. Anti-Roll Back mechanism has been fabricated and tested on the front axle assembly. The mechanism works well. Ratchet and pawl mechanism is used in many applications effectively where the one side power transmission is required. The project was divided into two phases. The First phase is to demonstrate the application of MEMS. The second phase of the project attempts controlling motors. The proposed mechanism is to reverse brake using ratchet gear. By reverse locking the differential is disengaged from the axle. Thus the power is directly transmitted to the axle and hence to the wheels. This will considerably reduce the power loss in some occasions when unwanted loss is happening due to the transmission if power from the shaft to the ratchet gear and then to the axle and hence to the wheels. So in mechanism the unwanted power loss in the due course of transmission through the gear wheel is reduced.

2. OBJECTIVE

Our aim in this project is to modify and fabricate the modern three axis trailer for industrial application. To give additional two directional motions to the trailer. To develop mechanism for reducing time of loading and unloading. To provide easier way dumping

- To achieve high safety
- To reduce man power
- To increase the efficiency of the vehicle
- To reduce the work load
- To reduce the fatigue of workers
- To high responsibility
- Less Maintenance cost

In this project work the design and construction of a model of automatic braking system for vehicles in hill station is to be developed. The mechanism has been developed to stop the vehicle from rolling back word when the vehicle is moving in the hill roads. This construction made of two phases in a first deigns of ratchet and pawl mechanism, frame, shaft, etc. is done and in second sensor selection and interference is done. Ratchet and pawl mechanism has been fabricated and assembly with sensor interface is tested Automotive vehicles are increasingly being equipped . Upon detecting a potential collision, such systems typically initiate an action to avoid the collision and/or provide a warning to the vehicle operator. The aim is to design and develop a control system based on an automatic, intelligent and electronically controlled automotive braking system for automobiles is called as "INTELLIGET BRAKINGSYSTEM". There is any obstacle in the path, the IR sensor senses the obstacle and giving the control signal to the microcontroller, which in turn sends a signal to the motor to stop and also to the solenoid so as to stop the vehicle as programmed. This project facilitates electromagnetic braking system using solenoid. Here in fabrication module include a circular disc associated with a dc motor and a solenoid. Embedded system module includes micro controller with a solenoid and sensor

3. LITRATURE REVIEW

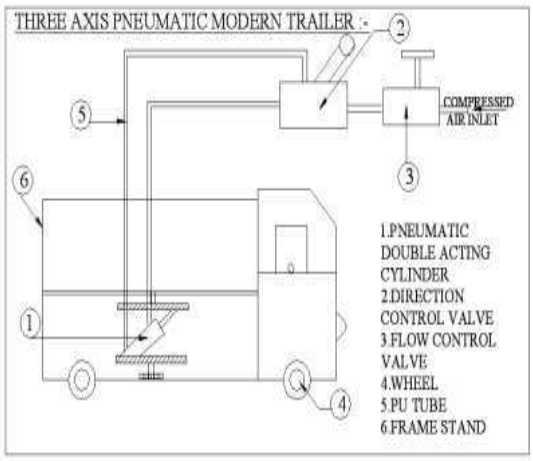
3.1 Amboji Sudhakar :
studied that trailer has lots of applications in today's world. In industrial and domestic considerations, trailer can haul a variety of products including gravel, potatoes, grain, sand, compost, heavy rocks, etc. By considering wide scope of the topic, it is necessary to do study and research on the topic of tipper mechanism in order to make it more economical and efficient. In existing system, trailer can unload only in one side by using hydraulic jack or conveyor mechanism. By this research it is easy for the driver to unload the trailer and also it reduces time and fuel consumption. For making trailer mechanism with such above conditions both mechanisms namely hydraulic jack and conveyor mechanism can be used. But eventually it comes with question that how both systems can arrange in single set up

3.2. Alley & McLellan of Glasgow :
studied hydraulics was being incorporated into truck mounted dump bodies relatively early on, in which record shows one of the first hydraulic dump bodies was the Robertson Steam Wagon with a hydraulic hoist that received power from the truck's engine or an independent steam engine was developed another early hydraulic dump body in 1907 that was power-driven by steam.

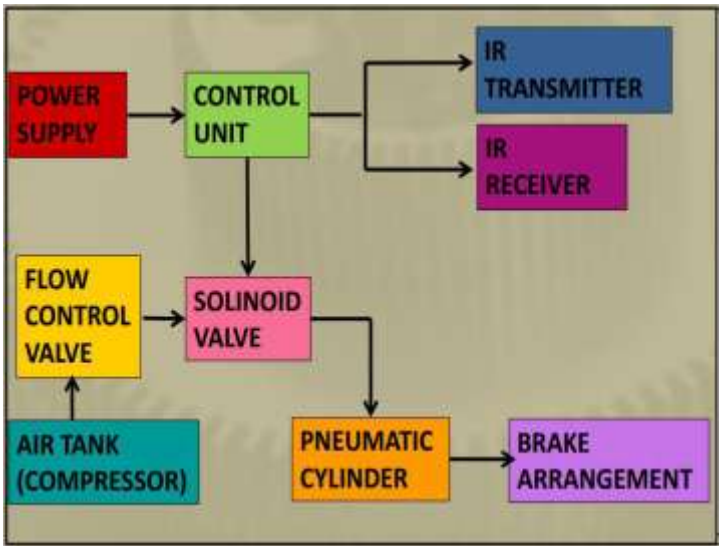
3.3 Atul R. Ghuge1, Sagar S. Abhale2
A. Design and Fabrication of Unidirectional Dumper [1] Design of unidirectional mechanism is done to help unloading loose material on 1800 of the tipper as per the availability of space. We have been able to increase the easiness in unloading trolley. Here combined objective function is considered, which minimizes the weight and center distance and maximizes power and efficiency.
B. Modelling and Analysis of Tractor Trolley Axle Using Ansys The possible loads acting and the place of loads are noted. According to the dimensions tractor trolley axle is modelled using CATIAV5 software and their specification.
C. Design and Development of 3-Way Dropping Dumper [3] The Direction control valves which activate the ram of the hydraulic cylinder which lifting the trailer cabin in require side. Further modifications and working limitations will put this work in the main league of use. This concept saves time & energy which leads to efficient working.
D. Design and Fabrication of 3 Way Tipper Mechanism [4] Hydraulic jacks use a plunger mechanism and no compressible fluid, typically a hydraulic oil to create required pressure and resulting lifting capability. In this project hydraulic jack is attached below whole setup to lift the trolley for backside unloading. Another early hydraulic dump body that was power-driven by steam.

4. METHODOLOGY

After going through various topics we have decided we select the topic of 3 way pneumatic dumper. We started the work of our project with literature survey. We went through many research papers. We sorted out some papers that were relevant to our topic. We got different ideas from different research papers. Thus we decided rough idea of how we are going to make our project. From this idea we have drawn a Rough model of our project and we came to know different components which we are going to use for our project. From this drawing we started the design and calculation part of different component which will be required to manufacture. From these calculations we have got some specifications of components. We have referred different design data books while doing the calculations. After getting the specifications we have again drawn a drawing



In this work, Ratchet and Pawl mechanism is identified to arrest the backward motion to the car. The ratchet is placed in the front drive shaft and the Pawl is fitted with the frame. When the vehicle is moved in the hill road, the lever has to make the pawl to touch the ratchet. If the vehicle tends to move backward direction, the pawl would stop the ratchet to move Counter Clock-wise direction with respect to front wheel. As the vehicle is in neutral position, the pawl engaged the ratchet and the vehicle did not move in. The IR TRANSMITTER circuit is to transmit the Infra-Red rays. If any obstacle is there in a path, the Infra-Red rays reflected. This reflected Infra-Red rays are received by the receiver circuit is called "IR RECEIVER". The IR receiver circuit receives the reflected IR rays and giving the control signal to the control circuit. The control circuit is used to activate the solenoid valve. If the solenoid valve is activated, the compressed air passes to the Single Acting Pneumatic Cylinder. The compressed air activates the pneumatic cylinder and moves the piston rod. If the piston moves forward, then the braking arrangement activated. The braking arrangement is used to break the wheel gradually or suddenly due to the piston movement. The braking speed is varied by adjusting the valve is called "FLOW CONTROL VALVE". The technology of pneumatic has gained tremendous importance in the field of workplace rationalization and automation from old fashioned timber works and coal mines to modern machine shops and space robots. It is therefore important that technicians and engineers should have a good knowledge of pneumatic system, air operated valves and accessories. The air is compressed in an air compressor and from the compressor plant the flow medium is transmitted to the pneumatic cylinder through a well laid pipe line system. To maintain optimum efficiency of pneumatic system, it is of vital importance that pressure drop between generation and consumption of compressed air is kept very low. The aim is to design and develop a control system based an intelligent electronically controlled automotive braking system is called "AUTOMATIC BRAKE FOR HILLS STATION". This Braking system is consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic braking system. The IR sensor is used to detect the hills obstacle. There is any obstacle in the path, the IR sensor senses the hills obstacle and giving the control signal to the braking system.

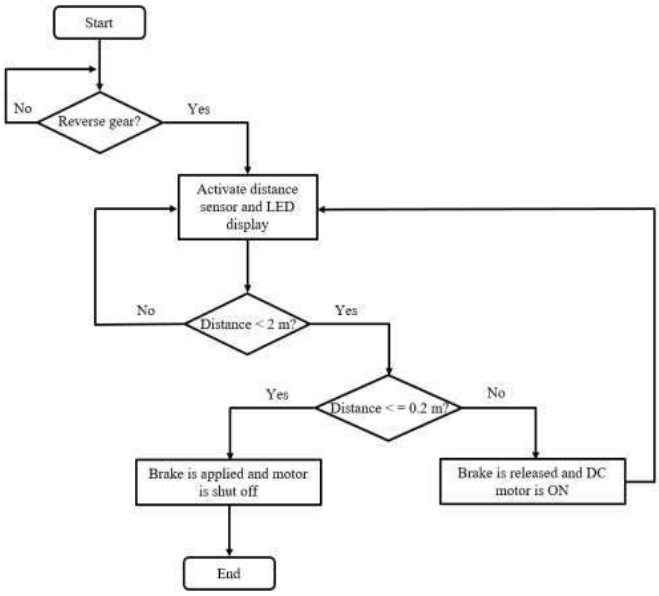


5. WORKING

The whole system operates only when the car is moving in reverse direction. When vehicle is the reverse gear, power supply is given to the sensor unit. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object as shown in figure. [3] This reflected echo is received by the control circuit. If there is no obstacle in a path, the receiver circuit will not receive any signal and the whole signal remain as it is. Ultrasonic sensor receives the reflected echo and giving the control signal to the control circuit. The control circuit is used to activate the solenoid valve. If the solenoid valve is activated, the compressed air passes to the double acting pneumatic cylinder. [6] The compressed air activates the pneumatic cylinder and moves the piston road. If the piston moves forward, then the braking arrangement is activated. The braking arrangement will used to stop the wheels gradually or suddenly due to the piston movement. [7] For the blind spot reduction, shown in figure, two ultrasonic sensors are used which are attached at the side A pillars. LEDs are used to indicate driver during changing the lane or at the corner. When the sensor detects any vehicle in the range, it will send signal to the same IC circuit used in reverse braking system and indicate on the LED screen.

The figure shows an initial position of the brake assembly. When no obstacles are found by sensors, then there is no data given to the control circuit so the pneumatic system is not activated hence there is no movement of the single acting cylinder towards the rotating hub which is attached at the shaft. The figure shows a brake applied after sensing any obstacle. When any obstacle enters in range of the sensor,

the sensor sends the data to the control circuit. After receiving the data from the sensor the control circuit activates the pneumatic system and by the compressed air the pneumatic cylinder moves forward and coming in contact with the rotating hub and because of the friction between them the brake will be applied



LIST OF COMPONENTS

The major parts "HYDRAULIC THREE AXIS MODERN TRAILER" are described below:

6.1 Hydraulic cylinder

6.2 Trolley

6.3 Chassis (Base frame)

6.4 Connecting hoses

6.5 Wheel arrangement

6.6 Vehicle model frame

ADVANTAGES

- Lifting cost will be less.
- Free from wear adjustment.
- Less power consumption
- Less skill technicians is sufficient to operate.
- Installation is simplified very much
- Increased moving ability: Thus, it does not become tiresome to perform the job.
- Can be used in very compact places: Where the reversing & turning of vehicle is difficult.
- Can accommodate into pass on dam site working: Saves time & energy.
- It requires simple maintenance cares
- Checking and cleaning are easy, because of the main parts are screwed.
- Handling is easy.
- Manual power not required
- Repairing is easy.
- Brake cost will be less.
- To avoid other burnable interactions viz.... (Diaphragm) is not used.

FUTURE SCOPE

The process of unloading the trailer trolley in left and right direction can be made easier by implementing electric motor system instead of hand lever. Electric motor can be attached underneath the conveyor system and input power can be given to the roller with help of belt and pulley arrangement. Hydraulic jack can be implemented for backside unloading instead of hydraulic cylinder. This implementation will increase the trolley lifting angle up to 45 to 50°

- Pneumatic cylinder can be used instead of Hydraulic cylinder to carry light weight load.
- Instead of one large cylinder, two small identical cylinder of same capacity can be used to lift higher loads. This helps to reduce the pump work.
- Precision control over the positioning of the cylinder can be achieved by incorporating proper sensor arrangement

World progressing at faster rate which demands efficient working equipments such as user friendly machineries and hence the three way dropping dumper may be used more than the two way or one way

.

The work can be modified further more on following basis:-

 Dual stage cylinders can be used.
 Oil pump can be used instead of powered cylinder.
 Capacity can be increased.
 Four wheel steering can be adopted for more movement ability

The whole system works only while reversing the vehicle. When the sensor senses any obstacle behind the vehicle, it sends signal to the control unit (FPGA). FPGA which act as a controller logic is designed with the help of FSM, which will sense the object according to the digital input and action will be taken accordingly.

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