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DESIGN OF AUTOMATIC BRAKING SYSTEM FOR VEHICLES IN HILL STATION

SOURABH SANTOSH JOSHI
B.E. Mechanical Engineering, S.B. Patil College of Engineering.

VISHAL SATISH JADHAV
B.E. Mechanical Engineering, S.B. Patil College of Engineering.

DHANANJAY PRAMOD BHOSALE
B.E. Mechanical Engineering, S.B. Patil College of Engineering.

PROF. MALAVE A.C.
Assistant Professor, Department of Mechanical Engineering, S.B. Patil College of Engineering- 413106, INDIA.

ABSTRACT
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.

KEYWORD: Ratchet, Pawl, IR sensor, Solenoid valve, shaft.

INTRODUCTION

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.

METHODOLOGY

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.

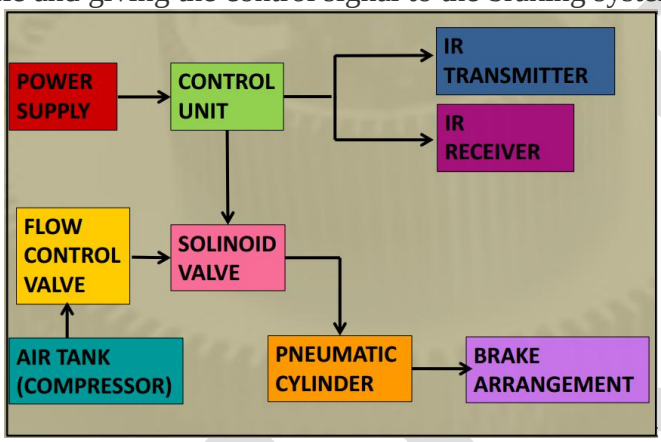

Fig.1 Block Diagram

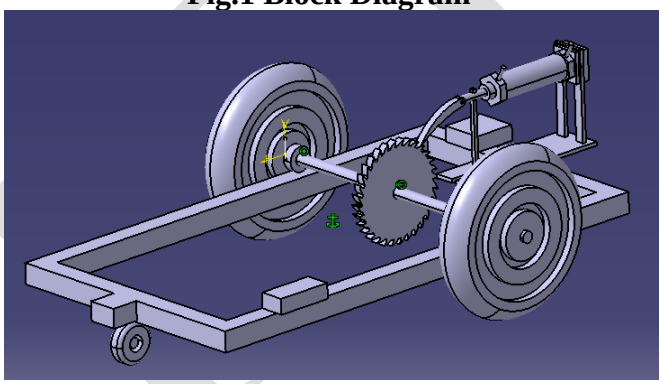

Fig.2 Proposed Model of Project Using CATIA V5 Cr21

DISIGN OF RATCHET AND PAWL

This system is design for loading condition of vehicle MARUTI SWIFT DZIRE. The circumference of the front drive shaft of theses car is measured and the diameter is determined as 23.89. The weight and torque of the car is 1060kg and 190N-m respectively. The percentage slope considered as 40%. The material used for ratchet and pawl are grey cast iron and C45 respectively. The number of teeth is assumed as 12.

Module (m)	4mm
Width of ratchet (b)	10mm
Minimum number of teeth on ratchet	32
PCD of ratchet	123mm
Diameter of pawl (Dp)	10mm
Length of pawl (L)	70mm

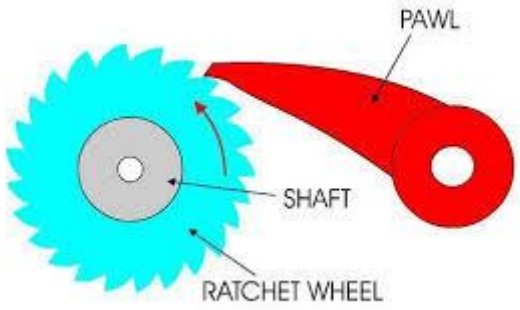

Fig.3 Schematic of Ratchet Pawl

IR REVERSE MOTION SENSOR

PIR sensors are more complicated than many of the other sensors explained in these tutorials (like photocells, FSRs and tilt switches) because there are multiple variables that affect the sensors input and output. To begin explaining how a basic sensor works, we'll use this rather nice diagram (if anyone knows where it originates please let me know). The PIR sensor itself has two slots in it; each slot is made of a special material that is sensitive to IR. The lens used here is not really doing much and so we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.

ADVANTAGES

- Brake cost will be less.
- Free from wear adjustment.
- Less power consumption.
- Less skill technicians is sufficient to operate.
- It gives simplified very operation.
- Installation is simplified very much.
- To avoid other burnable interactions viz.… (Diaphragm) is not used.

CONCLUSION

Thus the mechanism can stop the vehicle from rolling back in hill roads. This would be more helpful for the drivers to drive their cars comfortably in hilly roads and he can take off the car in the uphill without rolling back the car. The project safety auto brake system for hill station vehicle using MEMS sensor has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every component has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

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