DESIGN PROTOTYPE MODEL OF PNEUMATIC VEHICLE COMPRESSED AIR AS FUEL

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***Abstract*—The pneumatically operated vehicle is used to save the non-renewable sources of energy and stop the environmental pollution, which is harmful for human beings. Now a days battery operated vehicles used in all manufacturing industries has disadvantages like high weight, takes more time to charge the battery, critical connection of switches and relays. It requires more maintenance. These problems are solves in pneumatically operated vehicle which has low weight, easy circuits, takes less time for refuelling and requires less maintenance. The Compressed Air Powered Vehicle works on the principle of the compressed Air Technology (CAT). This energy can be utilized for useful purposes. When this compressed air expands, the energy is released to do work. By using the above Concept we are designed a proto-type model of pneumatically operated vehicle. In this system a double acting pneumatic cylinder is operated as a slider crank mechanism which converts the linear reciprocation of the cylinder piston rod into oscillatory motion of the driver crank about the pinion shaft.**

I. INTRODUCTION (HEADING 1)

In a pneumatic system, the working fluid is a gas (mostly air) which is compressed above atmospheric pressure to impart pressure energy to the molecules. This stored pressure potential is converted to a suitable mechanical work in an appropriate controlled sequence using control valves and actuators. Conversion of various combinations of motions like rotary-rotary, linear-rotary and linear-linear is possible. Pneumatics is all about using compressed air to make a process happens. Compressed air is simply the air we breathe squeezed into a small space under pressure. You might remember that air under pressure possesses potential energy which can be released to do useful work

II. PROBLEM FORMULATION

1. Reduction of weight of vehicle.
2. Reduce environmental pollution.
3. Make Simple structure of vehicle.
4. Change of mechanism.

III. OBJECTIVES

Objectives are as follows:

1. To control the emission
2. To save the non-renewable sources of energy
3. In IC engine replace piston by using double acting cylinder
4. To reduce the vehicle weight by changing components

1) POSSIBLE OUTCOMES

1) Reduce the environmental pollution
2) Reduction in harmfull effects pollutants

IV. LITERATURE REVIEW

S **Anirudh Addala & Srinivasu Gangada,** Viswanadha Institute of Technology and Management; "Fabrication and Testing of Compressed Air Car"; Global journal INC. (USA); Year-2013.

Examines the performance of a car which takes air as the working medium. Air car is a car currently being developed which is still in the R&D stage all over the world. Compressing a gas into a small space is a way to store energy. When the gas expands again, that energy is released to do work. That's the basic principle behind what makes an air car move.

A.A. Keste, S.B. Vise, A.N. Adik, P.R. Borase; "Vehicle Operating on Compressed Air by Inversion of Slider Crank Mechanism"; IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE); Year-2013.

Describes the working of a vehicle which works on pneumatic power. In this system a double acting pneumatic cylinder is operated as a slider crank mechanism which converts the linear reciprocation of the cylinder piston rod into oscillatory motion of the driver crank about the pinion shaft.

S.S. Verma, S.L.I.E.T., Longowal; "Latest Developments of a Compressed Air Vehicle: A Status Report"; Global journal INC. (USA); Year-2013.

introduce to the latest developments of a compressed-air vehicle along with an introduction to various problems associated with the technology and their solution. Compressed air as a source of energy in different uses in general and as a nonpolluting fuel in compressed air vehicles has attracted scientists and engineers for centuries.

Dr. S.S.Thipse; "Compressed air car"; Tech Monitor; Nov-Dec 2008.

Describes the development of compressed air engine. MDI is one company that holds the international patents for the compressed air engine. Although it seems to be an environmentally-friendly solution, One must consider its well to wheel efficiency.

B.R.Singh & Onkar Singh; "Study of compressed air as an alternative to fossil fuel for automobile engines".

Studied about alternative fuel for automobile engines with a special emphasis on compressed air driven engine. In view of the enormous potential of air as working fluid an engine is being designed to run on compressed air.

Saurabh Pathak, Kontham Swetha, V.Sreedhar, V.S.V Prabhakar; "Compressed air vehicle: a review"; 4th IRF International Conference, Chennai; 9th March-2014.

States the effective application of pneumatic power. Pneumatic vehicle will replace the battery operated vehicles used in industries. Pneumatic powered vehicle requires very less time for refueling as compared to battery operated vehicle. On the whole, the technology is just about modifying the engine of any regular IC engine vehicle into an Air Powered Engine

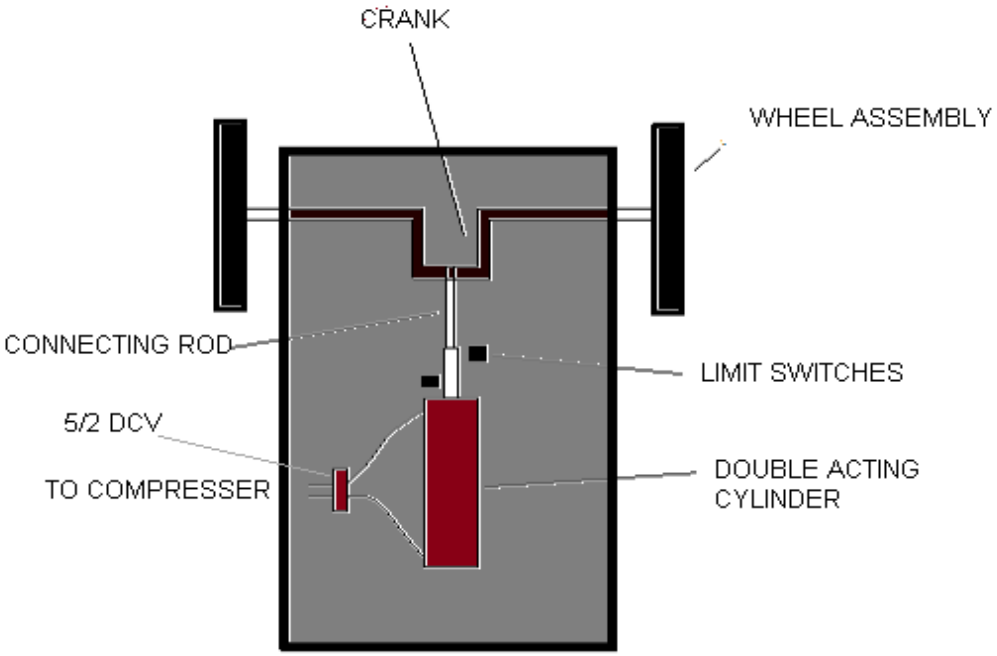
Gaurav Kumar tandan, Gopal Sahu, Prakash Kumar Sen, Ritesh Sharma, Shailendra Bohidar; "A Review Paper On Study And Development Of Compressed Air Engine And There Power Source".
International Journal of Science, Engineering and Technology Research (IJSETR), Volume 4, Issue 11, November 2015 This paper discusses the study of the basic object with Compressed air Technology is to implement in vehicle for consumption of minimum amount of energy and remain the output work same. air technology makes it happen from many aspects. It is very less in term of mass as compared with other sources of energy for transportation of material. It also improves urban life style through sustainability & Non-polluting vehicle. Its impact on the environment is also considered low. It remains with intelligency, lighter, style and comfort.

Ruchil A. Patel;"A Study on Compressed Air Engine Technology: A Review"; International Journal of Advanced Technology in Engineering and Science Volume No 03, Special Issue No. 01, April 2015.
This paper discusses the study of compressed air is efficient, clean as well as safe in terms of inflammable property. It is not combustible and non-polluting. As per thermodynamic laws, air of atmosphe ric pressure can be mechanically compressed by compressor the transformation of ressure of air is at 1 bar up to 414 bar. According to boyle's law, volume decrease during compression then pressure increase. As per Charle's law volume is directly proportion to temperature. As conclusion of these laws; pressure, temperature and volume are in proportionality relation, changes of one, and makes other change.

N.A.Todkar, R.H.Dhonde, N.S.Gawade, S.B.Shinde, S.S.Kale; "Pneumatic Vehicle Using Compressed Air: A Real Solution To Pollution And Fuel Crisis"; International Journal of Recent Research in Civil and Mechanical Engineering (IJRRCME) Vol. 2, Issue 1, pp: (110-116), Month: April 2015 – September 2015.
This paper discusses the study ofThe main objective of this project is to reduce dependency of vehicle on conventional fuel. The air car is a car currently being developed which is still in the R&D stage all over the world. Compressed air is stored in storage tank with some modifications from the compressor. The pneumatic motor (vane type motor) is used to convert pressure energy into mechanical energy.With some modifications in storage tank, pneumatic motor, materials used for chassis it is possible to increase the performance of vehicle.

V. ANALYTICAL WORK

Working mechanism



Pneumatic Vehicle Conceptual Diagram

- Our mechanism is inversed slider crank mechanism (same as IC Engine).
- Using double acting cylinder instead of piston to rotate crank shaft
- In this vehicle sliding motion is convert into rotary motion
- For this vehicle only compress air is used.
- Not any external power supply used like ac or dc.

Pneumatic circuit design

1. Basics of Pneumatics
2. Pneumatic Components
3. Basic Pneumatic Circuits
4. Cascade Design

CALCULATED DATA

a) Piston force
b) Number of strokes
c) Speed of the vehicle

VI. Experimental Validation

Logics in Pneumatic Circuit Design

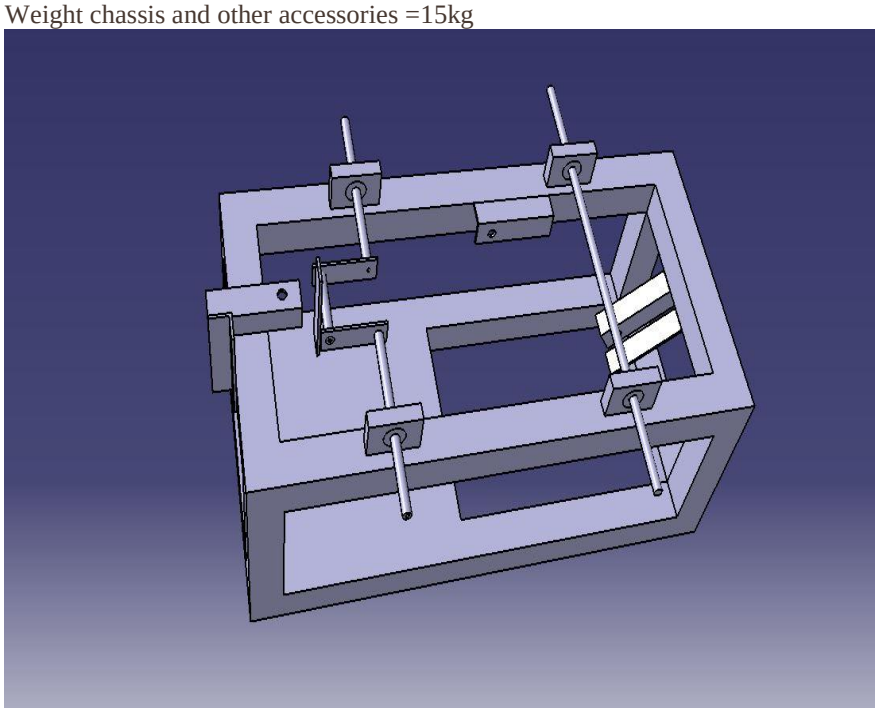
Logic controls can be defined as design of control system based on reasoning arising out of deductive principle. Famous Greek philosopher Aristotle (384-322 BC) is said to be the father of deductive logic.
Some logic function used in pneumatic circuit design-

- AND- function
- OR- function
- NOT- function
- NAND- function
- NOR- function
- Memory- function

Design of chassis

Dimensions 600*250*300mm

Weight chassis and other accessories =15kg



3D CAD model

Design for pressure vessel

Volume of tank=0.637lit

for 5 m traveled distance piston will oscillate inside the cylinder 8 times & 0.5628 lit.

speed of vehicle

Theorotical speed=6.217km/hr

Actual speed

Without Load condition =1.6286m/s=5.86296km/hr

With 5kg load =1.25m/s =4.5km/hr

CONCLUDING REMARKS

The technology of compressed air vehicles is not new. In fact, it has been around for years. Compressed air technology allows engines that are both non-polluting and economical. This report the effective application of pneumatic power. Pneumatic vehicle will replace the battery operated vehicles used in industries. Pneumatic powered vehicle requires very less time for refueling as compared to battery operated vehicle. This is totally clean, light weight circuit, can work in hazardous environment and requires less maintenance.

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