

Design And Fabrication Of A Bicycle That Runs On Compressed Air

Devashish Tiwari^{1*}, Shubhagy Sahu¹, Rahul Verma¹, Priyanshu Sharma¹, Suraj Yadav¹

^{1,2,3,4,5}(Mechanical Engineering Department, United College of Engineering and Management Allahabad, U.P. India

*Corresponding Author: Devashish Tiwari

ABSTRACT : This paper is more about advancement of a traditional bicycle into a hybrid cycle with options of pedaling as well as pneumatic aid which significantly reduces the muscle power taken by driver also sustain the momentum for longer time. Sustainability of momentum is the prime focus which is consequence of low muscle plus pneumatic power resulting less frequently pedaling by driver. The rear wheel of cycle is completely modified and carries all the major changes needed to establish such system. It is loaded with most of needed safety and regulation mountings and accessories like pressure gauge and flow regulator for safe operation and is perfect example of utilizing the crank slider crank mechanism to employ the elementary cycling with pneumatic advancement. Slider crank is used to transfer the rotational force to pneumatic piston which subsequently works as air compressor for the air reservoir around the directional valve to the pneumatic piston itself.

KEYWORDS—: Compressed air, Pneumatic, CAV, Hybrid bicycle.

Date of Sumisión: 06-06-2018

Date of acceptante: 21-06-2018

I. INTRODUCTION

HYBRID VEHICLE IS AN AUTOMOBILE WHICH COMBINES MORE THAN ONE METHOD OF PROPULSION SYSTEM. IT CAN BE ANYTHING FROM A PETROL WITH ELECTRIC MOTOR, PETROL WITH A HYDRAULIC MOTOR, DIESEL WITH ELECTRIC, SOLAR POWER OR EVEN COMPRESSED AIR (PNEUMATIC). IN FACT, WE ALREADY SEE AROUND US SO MANY HYBRID CARS AND MOTORCYCLES RUNNING CNG WITH PETROL AND EVEN MOTORCYCLES WITH LPG. THE HYBRID BICYCLE CAN EITHER BE PEDALLED MANUALLY OR BE RUN ON COMPRESSED AIR. COMPRESSED AIR IS USED TO TURN THE REAR WHEEL THROUGH A SLIDER CRANK MECHANISM VIA A CHAIN AND SPROCKET. THE ACTUATION OF THE PNEUMATIC PISTON USED IN THE SLIDER CRANK MECHANISM IS CONTROLLED BY DIRECTIONAL CONTROL VALVE WHICH IN TURN IS ACTUATED BY A PUSH BUTTON. THE AIM OF THE PROJECT IS TO DESIGN AND FABRICATE A BICYCLE THAT RUNS ON COMPRESSED AIR AND CAN ALSO BE PEDALLED MANUALLY. WEIGHT OF THE CYCLE SHOULD BE AS LIGHT AS POSSIBLE FOR EASE OF CYCLING.

II. MATERIAL

[1] This paper explores 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. . At the end of this review we conclude that the compressed air technology can be tested and developed using the Vaned Type Novel Air Turbine as there are minimal losses and practically their efficiency varies from 72-97% which is very high when compared to a conventional IC engine. Future developments can be made by designing an ideal vehicle for this kind of engine.

[2] This is a revolutionary engine design which is eco-friendly, pollution free, but also very economical. This redresses both the problems of fuel crises and pollution. As the injection pressure has to be increased, the indicated mean effective pressure gets increased; hence the indicated power is increased upon the application of the load. Though the applied load was small, however, the developed power was in proportion to the applied load. As load was applied the speed was reduced, to maintain it constant, the inlet air pressure has to be increased. As shown injection pressure is increased. In the present case the speed was maintained constant as

600 rpm. As the output speed was less the brake power was significantly lower. The mechanical efficiency is increasing with the increase of output power. At lower output it was very low.

[3] Even though the vehicle is in its early stage of development, it holds a lot of promise and provides scope for further research. Considerable efforts have been focused on the better understanding of various design developments in bicycle. . The project presented has involved the development and implementation of automatic transmissions for bicycles. The motivation of this work is to implement this idea in pneumatic featured bicycles with a suitable air control. The automatic transmission can be also used in 3 and 4 speed versions by altering few changes in the program. Therefore from the above calculations it is evident that the forces exerted by the cylinders are optimum to move the shifting levers (pedals).

[4] It's important to remember that while vehicles running on only compressed air might seem like a distant dream, but they still have public interest due to their environmental friendly nature. Efforts should be to make them light, safe, cost effective and economical for deriving. Compressed air for vehicle propulsion is already being explored and now air powered vehicles are being developed as a more fuel-efficient means of transportation. Some automobile companies are further exploring compressed air hybrids and compressed fluids to store energy for vehicles which might point the way for the development of a cost effective air powered vehicles design. Unfortunately there are still serious problems to be sorted out before air powered vehicles become a reality for common use but there is a hope that with the development in science & technology well supported by the environmental conscious attitude it will be possible. According to the achieved results, the suggested mechanism is realizable and workable. Using the simplest mechanism and required hardware enables to convert the old traditional gear shifting mechanism to semi-automatic one. The application of this mechanism leads to make the driving process easier

III. METHOD

3.1D.C.VALVE: A 5/2 directional control valve would have five ports and two spool positions. Ports are the one which helps the liquid to flow through them. A brief introduction is as follows-

3/2 and 5/2 hand lever operated compact series

type: Hand lever operated, Hand palm operated

Sizes: 3 mm, 6 mm & 10 mm (G1/8", G1/4" & G3/8")

Service: Compressed Air

3.2FLOW REGULATOR: A flow control valve regulates the flow or pressure of a fluid. Control valves normally respond to signals generated by independent devices such as flow meters or pressure gauges.



3.3 GATE VALVE Gate Valves are widely used in fluid-handling systems for flow control, Typical gate valves are designed to be fully opened or closed. When fully open, the typical gate valve has no obstruction in the flow path, resulting in very low friction loss.

3.4 PISTON AND CYLINDER: A pneumatic piston is used to utilize the mechanical advantage in liner movement of piston. The air entrapped in tank, which acts as a reservoir is compressed to draw such advantage

Bore Size 25 mm

Stroke Size 160 mm

Double Acting Cylinder



3.5 DESIGN METHODOLOGY: Welding an offset to the main rear support of wheel to hold the crank. A secondary free wheel welded to normal market supply. Created clip using galvanized tin at workshop. An auxiliary supported is cut out of tin sheet and bolted to main handle with all the mountings. A light weight mild steel disc was used initially which later replaced with a light aluminum disc due to buckling. It sufficiently reduced the inertia of part during very start of pedaling.

IV. FIGURES



V. CONCLUSION

It's important to remember that while vehicles running on only compressed air might seem like a distant dream, but they still have public interest due to their environmental friendly nature. Efforts should be to make them light, safe, cost effective and economical for deriving. Compressed air for vehicle propulsion is already being explored and now air powered vehicles are being developed as a more fuel-efficient means of transportation.

Some automobile companies are further exploring compressed air hybrids and compressed fluids to store energy for vehicles which might point the way for the development of a cost effective air powered vehicles design. Unfortunately there are still serious problems to be sorted out before air powered vehicles become a reality for common use but there is a hope that with the development in science & technology well supported by the environmental conscious attitude it will be possible.

REFERENCES

Journal Papers:

- [1]. SaurabhPathak, KonthamSwetha, V.Sreedhar, V.S.V Prabhakar, Compressed Air Vehicle: A Review, *International Journal of Mechanical And Production Engineering, Volume- 2, Issue- 4, April-2014*
- [2]. JP Yadav and Bharat Raj Singh, *Study and Fabrication of Compressed Air Engine* (2011S-JPSET : ISSN : 2229-7111, Vol. 2, Issue 1).
- [3]. P.Madhu Raghava1, T.Lokesh,M.Ravichandra,O.Jayaramudu, Design and Fabrication of Pneumatic Powered Two Wheeler, in *Int. Journal of Engineering Research and Application* ISSN : 2248-9622, Vol. 7, Issue 4,
- [4]. Mr. Rixon K L ,Mohammed Shareef, Prajith K , Sarath ,Sreejith S, Sreeraj, *Fabrication of Compressed Air Bike.*, *International Research Journal of Engineering and Technology (IRJET)*, Volume: 03 Issue: 03 | Mar-2016

Proceedings Papers:

- [5]. W.J. Book, Modelling design and control of flexible manipulator arms: A tutorial review, *Proc. 29th IEEE Conf. on Decision and Control*, San Francisco, CA, 1990, 500-506

Devashish Tiwari." Design And Fabrication Of A Bicycle That Runs On Compressed Air."American Journal Of Engineering Research (AJER), Vol. 7, No. 6, 2018, PP.234-237.