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In Built Air-Pump in a Bi-cycle

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Abstract

Every vehicle while travelling uses the tires to travel and the tires uses the air to keep floated and bear the stresses due the reaction between the road and the weight of the vehicle. Vehicles from a bi-cycle to the heavy loaded trucks uses the air in the tires. As a bicycle is made up of straight hollow pipes. These pipes can be used to work as an air pump. These pipes make the outer body of the air pump in which the piston and a rod makes the translator motion in up and down direction. The pumping action of the piston can be made with the help of the seat acting the handle of the air pump and the pumped air is made to pass to the tires with the use of a flexible hose pipe with pressure gauge or without pressure gauge. Thus it fulfills the need of an air pump required for travelling for a long distance. A stopper pin is provided to make the seat fixed while traveling and to act as handle after removing the pin to press the pump.

Keywords: *Air, Air-pump, Bi-cycle, Hollow pipe, Hose pipe, Piston, Pressure gauge, Seat.*

I. INTRODUCTION

Air pump pushes the surrounding air. For example, a bi-cycle pump. Pumps that are used to aerate a pond via an air-stone, a compressor is used to energize a pneumatic tool or pipe organ, bellows, a vacuum cleaner and a vacuum pump. All of the air pumps contain a part that moves (vane, piston, impeller, diaphragm etc.) which pushes the flow of air [1]. When the air moves, an area of low pressure gets created which fills up with more and more air. Pumps and the compressors are very similar in their operation mechanism and also perform the action but they work with different fluids, but at some points they differ which are:

1. Pumps fluids are generally liquids which are incompressible and the compressor fluids are generally gases.
2. Compressor generate a high pressure fluid in a closed system while the pumps generate little pressure against a free flowing with minimal back pressure.
3. Pumps are used to provide the continuous flow whereas compressors are used for intermittent cycles
4. Compressors generally encompasses a feedback sensor to switch off after attaining a particular desired pressure while the pumps have a fixed design and operate freely across as the conditions vary [2].

5. An air pump consists of simply an outer case in which a piston and a piston rod are enclosed. To press this piston rod and the piston a handle is provided on the outside of rod through which the piston is pressed against the air inside the case, this pushed air is made to pass through a flexible pipe known as the hose pipe. With this hose pipe are attached a valve suitable for the bi-cycle tire to fill air with pressure. A pressure gauge can also be attached with this gauge to fill the air inside the tire. Figure 1 illustrate the diagram of the simple air pump.

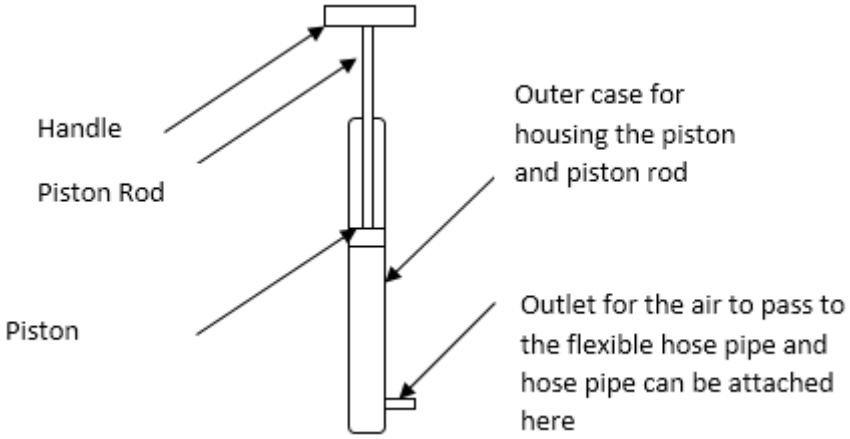

Fig. 1 Simple Air pump

A. Effect of air pump on the human life:-

1. Its invention further lead to the invention of the vacuum pump and the vacuum tube which are used in many different areas.
2. These are used in the manufacturing of the light bulbs and the freeze drying process in the medical, food and biological industries and the atomic energy sector.
3. Compressed air is used for the operation of the various pneumatic tools that are used in the industries, hotels, stadiums
4. Through the use of reciprocating pumps, engines were created for the use of the automobiles.

B. Types:-

An air compressor converts the power into potential energy. This potential energy is stored in a tank and forces air into the tank creating positive pressure. Normally a hose is connected to the tank and then when opened with a valve or switch air is shot out of the hose at high speeds.

1. Bellow:-

One of the oldest ways to pump air [3]. A simple mechanism that consists of a flexible bag that has rigid boards or handles on each side. The bag can be expanded and contracted by working the handles away from each other and together forcing air out of the nozzle. When the bag is

inflated or the handles are pulled away from each other a valve is opened on the side allowing air in. When the handles are pushed together that valve is closed and air is forced out the end.

2. Bicycle Pump:-

Through the use of a piston in a cylinder this pump creates pressure by using a one-way valve and a piston that is controlled by the handle. The Bicycle pump is a vertical hand pump that is used to inflate bicycle tires. These pumps are very common and can be used to inflate many things with the use of an adapter.

3. Diaphragm Pumps:-

In the category of the air pumps, diaphragm pumps are considered to be a type of pump that utilizes positive displacement[4]. A simple diaphragm pump contains a chamber that acts like a springy diaphragm. When compressed, the air within the diaphragm gets excludes out. When the diaphragm is decompressed, the chamber gets refilled again with air. A simple example for a diaphragm pump is a foot pump that requires the user to constantly step up and down on the pump to inflate something.

4. Reciprocating Pumps:-

A simple reciprocating pump is commonly made up of a cylinder with an inlet, an outlet, and a piston within. The inlet and the outlet are used to direct the flow of air, while the piston is used to generate the flow of air. When the piston is pulled up, air sucks into the pump through the inlet. The pump chamber depressurizes as it fills with air. When the piston is forced down, the air becomes compressed and closes the inlet. Then the air flows out from the outlet.

II. LITERATURE REVIEW

Y. Yuan, D. Hai, L. TianYu and L. G. Qiang in their research paper proposed a built in pump device for a bicycle based on the ADAMS [5]. In this paper cam follower arrangement has been used to pump the rod to pump the air filled into the tire. There is a valve which keeps monitoring the pressure inside the tire and fills the tire with the air as the pressure inside the tire reduces from a particular value. But this system is complicated and requires a lot of apparatus to pump the air and it requires a lot of maintenance and may get damage with the thrust acting on the tire. Secondly this system continuously maintains the tire pressure at the same pressure that may sometimes not be desirable and in the present research the system of air pump is very simple and cost effective and chances of damage are very far less and user can fill the air whenever and wherever required. Wang Chao, Si Hui proposed a design of a bicycle with lock type pump in which the pump is linked with the lock of the bicycle [6]. The pump can be used as the stool. The pump of the bi-cycle is of dual nature. But in the present research the pump is linked with the seat of the bi-cycle with the handle as the seat or handle can be used the seat. This research proposes a system which occupies no extra space whereas the research so far done for the pump requires space. Dixit Jagvir, Ali Mudasir, Mashhad Syed, Bashir Basharat in their research proposed a bicycle pump which can be used to create a 5m

head and to irrigate the farm lands where electricity is main problem and also the for the marginal land owners [7]. It can be used in every terrain and where canal irrigation is not possible. Thus this research is mainly focused on the water pump and the present research is based on the use of air pump deployed in a bi-cycle [8]. The present research uses the seat as the handle for the pumping action of the air.

II. RESEARCH QUESTION

1. What is an air pump?
2. What how to make the seat of the cycle to perform both the functions as a seat and as an air pump?
3. How to provide the pumped air from the hollow pipe of the bicycle to the tires of the bi-cycle?

III. METHODOLOGY

As the air in an air pump is obtained by pumping the handle attached with a piston. Similarly, air can be obtained at a pressure from such kind of confined space in which a piston and rod can make translator motion to pump the air filled inside the cavity at a pressure into a hose pipe. From this hose pipe air can be filled inside an object like balloon, tires etc. So, in this case we have tires as an object in which air has to be filled and the air can be pumped from the hollow pipe of the bi-cycle with a rod and piston making translator motion to pump the air and this rod piston arrangement can be moved with the help of seat as the handle. This pumped air can be made to pass to the tires at a particular pressure through a hose pipe. The length of the hose pipe is such that it can cover the distance to air valve of both the tires[9]. The best possible air pump can be made from the hollow pipe below the seat of the bi-cycle. Now the question arises how will it be possible to sit on the seat which moves downwards to press the air? For that a pin is provided which makes the seat to sit on and also makes the seat flexible enough to work as handle to press the air downwards inside the hollow pipe of the bicycle (Figure 2).

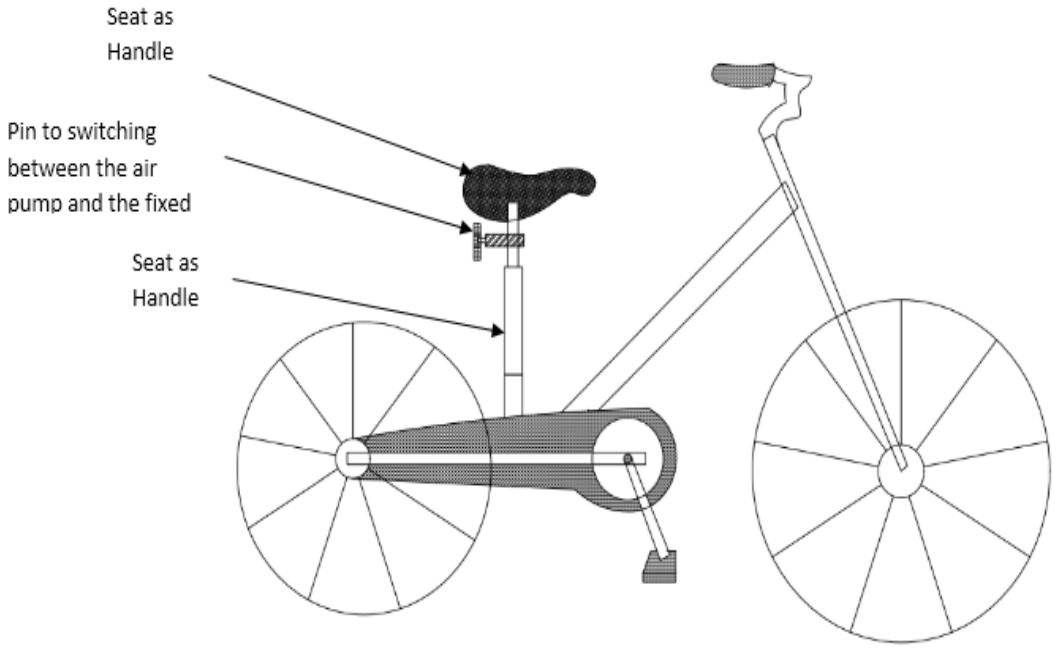

Fig. 2: Air pump made with the use of the hollow pipe of the bicycle

IV. RESULTS & DISCUSSION

The pumped air from the hollow pipe of the bi-cycle will be pumped into the hose pipe and the pressure of the air filled can be measured with the help of the pressure gauge. The hollow pipe of the bicycle may get heated due to the continuous pumping of the air into the hose pipe [10]. To prevent this heated pipe to come in contact with a person riding the bicycle and causing burn, this pipe can be covered with an insulating material may some rubber or plastic. The pin provided under the seat to prevents its translator motion must be made up of good quality material so that it can bear the stresses.

V. CONCLUSION

The air pump fitted along with the bi-cycle serves a lot of tasks. Firstly, there will be no need to carry a separate air pump to fill the air in the tires of the bi-cycle. With the proper air pressure in the tires of the bi-cycle, the bi-cycle can be cycled for a long distance. Mostly cycles are used for the racing purpose so there arises the need for the proper air pressure in the tires and this can be filled easily with the use of inbuilt air pump.

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