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# Design of Pneumatic Powered Drive System

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**Abstract:** *This project is the research, production and development of the pneumatic bike design and manufacture of the rear wheel drive. The theoretical development of this project was based on a manually operated bike. The full body looks like a bike accompanied by a manual operation. The device is a pneumatic machine that is useful for people with disabilities and also for ordinary people. The exchange of power takes place put by chain drive from the rear wheel. The entire power transfer system by means of the pneumatic effect torque wrench (air motor) taken with the sprocket of the line. The intensity at which air is sent will offer a driving force. Just one user is allowed at any time on the bike. The material, mild steel and key components were chosen as the main structure for connection This project includes the pneumatic torque wrench, the air compressor, the solenoid valve, the electrical control unit, the power transmission chain, the sprocket frame, the two axle rear wheel parts of the prototype, which are connected through welding. The prototype is checked by several people at the end of the project and their feedback is then documented and some experiments are done. The definition of throughout reality, compressed air bikes reduce air emissions, because their combustion is nothing but air*

## I. INTRODUCTION

Rapidly depleting fossil fuels (i.e. oil, gasoline, natural gas and coal) that satisfy most of today's global energy demand. However, their combustion products are causing global issues, such as the greenhouse effect, the degradation of the ozone layer by toxic rain and waste, which present a great danger to the atmosphere and consequently to the entire life of the earth. These are the key influences Automotive manufacturers to build cars fueled by alternative energy sources. Hybrid cars, Fuel-powered cars, Hydrogen-powered cars will shortly be on the road as a consequence of this Another possible alternative is an air-powered vehicle. Air which is readily available and free from pollutants, can be packed to a higher pressure at a very low cost, is one of the prime alternatives because of the ambient impact Pollution can be eradicated indefinitely. We are hereby proposing the design and manufacture of pneumatic bikes and continuing with a sense of awakening ideas on ECO FRIENDLY VEHICLES, thinking that only we engineers will take such an optimized commodity to the planet, so be prepared to change the life with today's fuel..

## II. IDEA DEVELOPMENT

A bicycle is a one-person air-operated power vehicle designed specifically for low mobility. It is usually used by those who travel shorter distances who have difficulty walking and traveling quickly from one location to another (older people). Bicycles are available in a variety of models, including those planned for use outside A bicycle is Different from a manually operated two wheel drive as a source of supply to an air motor that uses freely available Air as a working medium to transmit power from source to destination

## III. CONCEPTDESIGN

The bike has 2 wheels driven by a 580N-m pneumatic impact torque wrench mounted at the bottom of the main frame. The motorcycle is the rear wheel drive to get the energy from the torque wrench by the sprocket and the chain drive. This bike provides the rider with all the controls. Many people are a little worried about buying an automated bicycle as opposed to a manually operated bicycle because it's going to happen. It's hard to operate. In reality, the control console makes it quite easy, once a person has a feeling for it. Power scooters are also fitted with a disk brake system, so stopping is easy, safe and comfortable. There is no instantaneous bike on the market for shorter distances and for the disabled, which can minimize their physical work, this basic idea renders the venture special. The problem here is most of that bicycle is not flexible

#### IV. HISTORY

Many unverified claims were made for the development of devices such as bikes. The oldest comes from a drawing credited to Gian Giacomo Caprotti in 1493. Leonardo da Vinci unveiled the primitive version of a bike design in 1493. Comte de Sicrac designed the Celerifere in 1791. The Celerifere is intended to be a two-wheeled hobby horse instead of a rocker. An individual Through running or walking on their legs, they can move forward and then float on the celerifer. In 1817, the German baron, Karl Drais Von Sauerbronn, developed a laufmaschine, meaning a running machine, an updated two-wheel variant of the celerifer. It was nicknamed a walking tool, a velocipede, a Draisienne and a Dandy cow. It had a front steering wheel that was a little guiding the front axle. In the year 1839, The first mechanically propelled two-wheel automobile was designed by Kirkpatrick MacMillan. Throughout Velocipedes, he developed a series of levers and pedals which enables the driver to move the vehicle with the feet off the ground. In 1817, Baron von Drais developed a walking mechanism that would help him move quicker around the royal gardens: two in-line wheels of the same length, one steerable at the front, installed in a greenhouse. Frame you were straddling. By pressing your foot, the machine was propelled It gained a short-lived success as a fad, appearing in no other location suitable for travel than a well-maintained route such as in a park or garden.

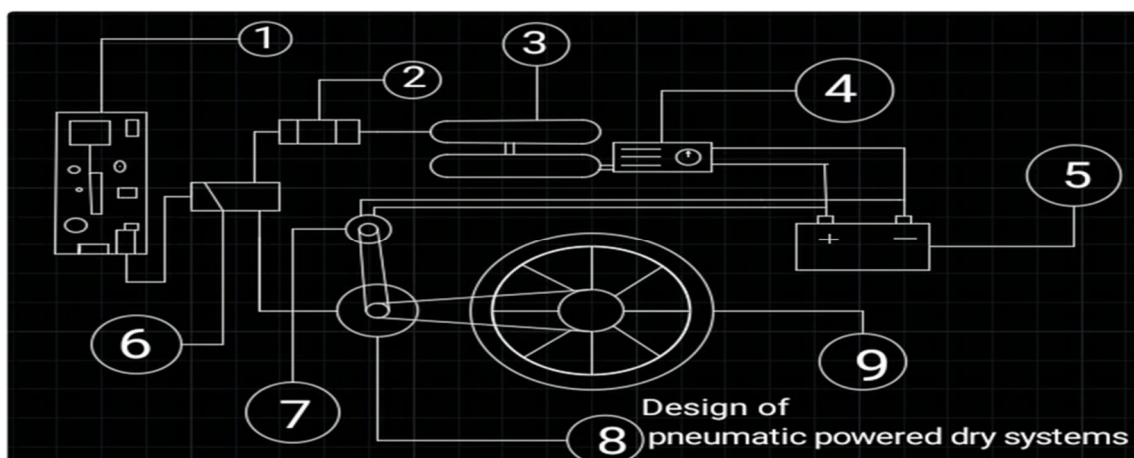
#### V. LITERATURE REVIEW

The versatility of pneumatic systems design, reliability and compact size render them well designed to mobile applications. Thanks to the advantages of low cost, easy maintenance, cleanliness, readily available, and inexpensive origin, pneumatic control system plays a very important role in the industrial system[1]. Product is particularly suitable for automobiles running on compressed air Handling and company guests. Compressed air storage energy (CASE) is a popular form of energy storage, with high efficiency and environmental friendliness[2]. The moped has a top speed of about 18 mph and could reach 7 miles before its air pressure runs out. An engineer, JemStansfield, has been able to convert a normal scooter to a compressed air moped[3]. Compressed air behaviour ]. Compressed air action Compressed air is clean, safe, easy and effective. There's no threat Compressed air is used as a tool for exhaust fumes or other hazardous materials. It is a non-fuel, non-contaminating service. If air is mechanically compressed by a compressor at atmospheric pressure, the laws of thermodynamics dictate the conversion of air at 1 bar (atmospheric pressure) into higher pressure air (up to 414 bar). We claim that the tension is rising Equals a rise in heat and a corresponding increase in energy is generated by compressing water. Boyle's rule states that the force is multiplied if a quantity of a gas (air) halves through compression. Charles ' law states that the density of a gas increases in direct proportion to the temperature[4]. With so much fuel the atmosphere spreads externally that the balloon bursts. Compression of a fuel into a tiny one Storage is an energy-saving method. When the gas bursts again, it absorbs the fuel to do the work. This is the fundamental principle behind what allows an air cargo[5]. It illustrates the value of the effect of fossil fuels on present and future generations, which has contributed to the development of a new

#### VI. OBJECTIVE

To design a pneumatic powered drive system and for bicycle and to for shorter distances with less cost and to Fabricate the model development of single rider automatically operated bicycle.

#### VII. DESIGN FLOW CHART

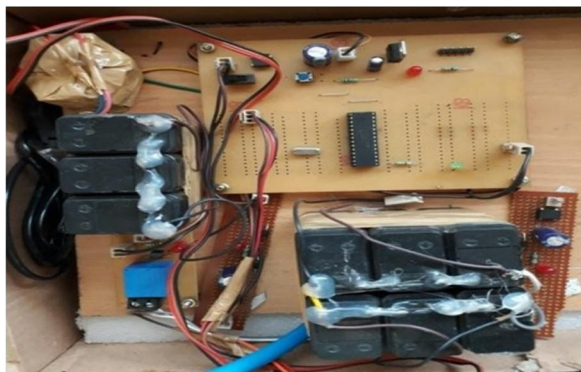




## Parts

- 1) Electrical control unit
- 2) F-R-L unit.
- 3) Battery
- 4) Air storage tank
- 5) Solenoid valve
- 6) Alternator or dynamo
- 7) Portable heavy duty air compressor
- 8) Pneumatic impact torque wrench
- 9) Rear wheel arrangement

### A. Electrical Control Unit



Using the converter, switch, voltage regulator, resistor, bridge rectifier, the electrical driver module is used to regulate the vehicle speed under the micro controller and two rechargeable batteries.

### B. Filter-Regulator-Lubricator

Filter regulator lubricator. What is a Filter Regulator Lubricator (FRL) meant for? Warm, dirty, or wet air leaving a compressor could harm and shorten downstream equipment life, such as valves and cylinders. It must be processed, controlled and lubricated before it can be used.

### C. Air Storage Tank



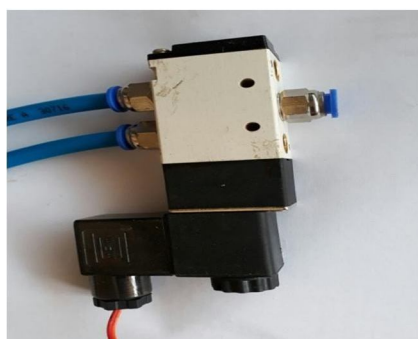
The high pressured compressed air is stored in the storage tanks and its is used for actuation of actuators these are available in variant sizes and in different capacities based on the requirement

#### D. Battery

Batteries are a series of one or more cells that produce a flow of electrons in a circuit by chemical reactions. All batteries consist of three basic components: an anode (the '-' side), a cathode (the '+' side), and some form of electrolyte (a material which interacts chemically with the anode and cathode)



#### E. Solenoid Valve



Solenoid valve is a control device that either shuts down or makes fluid flow once electrically energized or de-energized. The actuator is an electromagnet in the shape. Once energized, a magnetic field builds up that pushes against the movement of a spring a plunger or pivoting armature.

#### F. Alternator



An alternator is a electric generator which converts mechanical energy to electrical energy this alternators generates the energy when they are coupled to any mechanical devices and these are used to recharge the batteries when they are in use

#### G. Portable Air Compressor

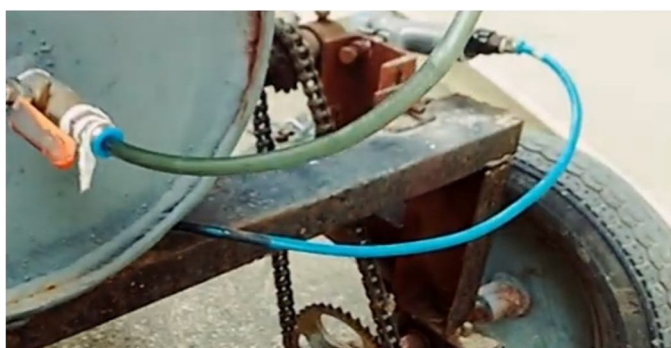


Air compressor is a device which compresses atmospheric air to a high pressure air this portable air compressor runs with a 12v dc battery and air outlet is further connected to the air storage tank

#### H. Pneumatic Impact Torque Wrench



Pneumatic torque wrench is pneumatic power tool with high torque rate @500-600 N-m, torque can be controlled by means of regulating air pressure it consumes 20-30 cubic feet per minute (CFM) air and Rpm ranging from 3000-6000 and basically it is a air motor with gear arrangements with bidirectional rotation and the bidirectional flow can be controlled by means of direction knob which indicates the flow direction as forward and backward and its is selected according the purpose of usage.



The above pictures demonstrates the Arrangement of pneumatic torque wrench to the chain sprocket and to the rear wheels by means of rigid drive and the small sprocket gear is connected to wrench nose side and big sprocket gear is connected to rear shaft on which wheel is mounted this both gears are connected by means of chain as it provides good energy transmission from source to driven member without any slippage between them.



## VIII. CONSTRUCTION

This comprises of a chasis, pneumatic torque wrench that is secured with the aid of a c clamp on the bottom of the frame. 12V DC air compressor used for ambient air compressor worked on 12V batteries. The air storage tank is mounted on the chassis base. The shaft or axle is attached to the base by way of a pedestal, consisting of a bearing sealed in the frame. The drive of the chain is used to transfer the energy from the torque to the rear axle.

## IX. WORKING

It works on the principle of energy conversion where the potential energy of the air is converted to the kinetic energy this takes place When the system is turned on by means of slowly regulating flow of air as flow starts pneumatic wrench starts rotating by using the chain drive and sprocket gear arrangement the energy transferred from torque wrench to the rear wheels and speed is controlled by a accelerator

## X. SPECIFICATIONS AND CALCULATIONS

Storage tank-180 liters capacity

Battery-12 v dc battery

Pneumatic torque wrench-1/2 inch @580N-m torque in free load and 350N-m at partial load condition

8000Rpm at free load condition and 2550 Rpm at partial load condition

weight@2.55 kg with twin hammer mechanism with bidirectional nose rotation

Air compressor-12v dc compressor with capacity of 90 lit compressed air per minute with a maximum pressure of 150 bar mounted with digital pressure gauge

Total estimated running distance-1.4 kilometers for full tank of compressed air @ 10 km/hr

1.0 kilometers for full tank of compressed air @ 20 km/hr

Time taken to full the tank with air -2mins 10sec approx

Air required to run the torque wrench per min-22cfm x 60=1,320 lits

Total weight of system-55kgs

Energy required -2012.3 watt

### A. Merits

- 1) Because of its straightforward structure as a motorcycle and its light weight, it is easy to drive and manage
- 2) It is automatic in operation and instant torque is high
- 3) It has a compact design and elegant appearance.
- 4) Maintenance cost is low

### B. Demerits

- 1) It cannot be used for longer distances
- 2) It is noisy in operations and vibrations are high
- 3) Balancing is difficult in uneven roads.
- 4) Preferred for a single person drive only as load increases efficiency of the system decreases.

## XI. CONCLUSION

Although the system is in its early development stages, it holds a great deal of potential and offers room for further testing. Considerable efforts have been made to enhance awareness of the different design trends of bikes. Various forms of bicycle in past history, through which the present form has emerged, are explored in this article. Different Empirical Techniques Transmitting of human power on the pedal to the movement of the wheels is addressed and the key advantages and disadvantages of these transmitting approaches are mentioned. Ideally, different systems should be developed to make the model more environmentally friendly and energy-efficient The proposed plan included the development and implementation of automatic transmission of bicycles. The purpose of this project is to incorporate this concept with an effective air control in pneumatic integrated bicycles. Automatic transmission can also be used in 3 or 4 speed models by making a few changes to the program. It is therefore clear from

the above equations that the pressures exerted by the cylinders are ideal for driving the moving levers (pedals). Based on the results obtained The method presented is practical and workable. Using the simpler system and hardware available, the old traditional gear shifting device can be changed to a semi-automatic one. The implementation of this method would allow the driving process easier, reduce the risk of destabilizing the vehicle, the lap / stage period and the probability of losing a change.

## XII. FUTURE SCOPE

In future it can be flexible in seating and can be modified based up on the once interest and can able to travel a minimum distance when compared to the past

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