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HYDRAULIC CUM PNEUMATIC VEHICLE

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1.0 INTRODUCTION:

In present world the problem of pollution and continuous use of fossil fuels is a major concern. Since the non-renewable resources are getting exhausted continuously and adding to that with increasing use there is an increase in pollution levels, damaging the environment and human health. So in such an environment use of renewable resources becomes need of the hour. Looking the same context, through this power e have tried to develop a pneumatic actuated vehicle which works through use of naturally available air fulfilling the idea of a clean energy system.

In a pneumatic system, the working fluid is air which is compressed above the 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 valve and actuators. Conversion of various combinations of motions like rotary-rotary, linear-rotary and linear-linear is possible. The simplicity in design, durability and compact size of pneumatic systems make the well suited for mobile application. Pneumatic control system plays very important role in industrial system owing to the advantages of low cost, easy maintenance, cleanliness, readily available, and cheap source, etc. a particularly well suited application for vehicle operating on compressed air is material handling and for visitors in industry.

Compressed air storage energy is a promising method of energy storage, with high efficiency and environment friendliness. Compressed air is regarded as fourth utility, after electricity, natural gas, water and the facilitating production activities in industrial environment. Unfortunately production of compressed air solely for pneumatic vehicle is not affordable but in manufacturing industries compressed air is widely used for many applications such as cooling, drying, actuating and removing metal chips. In addition, as a form of energy, compressed air represents no fire or explosion hazards; as the most natural substances, it is clean and safe and regarded as totally green. The performance of pneumatic vehicle, in which the importance of the impact of the fossil fuels in the present and future generations has led to design a new vehicle which runs by renewable energy sources. Compressed air vehicle are more suitable for low speed, short range and flammable environment. An inventor, JemStansfield, has been able to convert a regular scooter to a compressed air moped. The moped has top speed of about 18 mph and could go 7 miles before its air pressure ran out. During literature survey it is observed that compressed air vehicles has many potential advantages over electric vehicles which includes no degradation problems of batteries, time required for refueling the tank, easy disposal of compressed air tank without causing any pollution as with the batteries. Hence in order to overcome the above stated problems there is a need of eco-friendly vehicles using compressed air as a working medium in future. In this work a sincere effort is made to develop Vehicle operating on compressed air by inversion of slider crank mechanism.

2.0 AIM AND OBJECTIVE OF THE PROJECT:

Aim of our project is described by the topic of our project as to develop a pneumatic vehicle which is economic, durable, compact, light-weight and affordable. Objective of our project is to develop pneumatic vehicle which works on air fulfilling the idea of a clean energy system. Fossil fuel which makes meet most of the world's energy demand are being depleted rapidly. Also, their combustion products are causing global problems, such as greenhouse effect, ozone layer depletion, acid rains and pollution which are posing great danger for environment and eventually for the total life on planet. So objective is to develop eco-friendly vehicle, safe, light-weight and cost effective compressed air vehicle.

3.0 LITURATURE REVIEW:

An air driven vehicle utilizes pressurized air contained in storage tanks for actuating double-acting cylinders which in turn transmit a driving force to an axle of the vehicle. The compressed air in a first air tank under high pressure is fed to a first actuating cylinder so as to drive a crank which operates a main drive gear in communication with an axle gear attached to the vehicle axle. Upon a reversal of movement of the piston contained in the first actuating cylinder, a supply of exhaust air is directed from the cylinder to a second air pressure tank in which the exhaust air is collected under a lower pressure than the air contained in the first air pressure tank. The exhaust air is prevented from flowing back into the first actuating cylinder through the use of a one-way check valve, and the pressurized exhaust air in the second pressure tank may then be used to impart a driving force to a second actuating cylinder attached to the same crank so as to provide a supplementary force to the main drive gear in propelling the vehicle. The air exhausted from the second actuating cylinder during the return stroke of a piston in the cylinder may then be similarly employed to drive even additional actuating cylinders or may be exhausted to the atmosphere.

4.0 PROPOSED SYSTEM:

CONCEPT OF DESIGN:

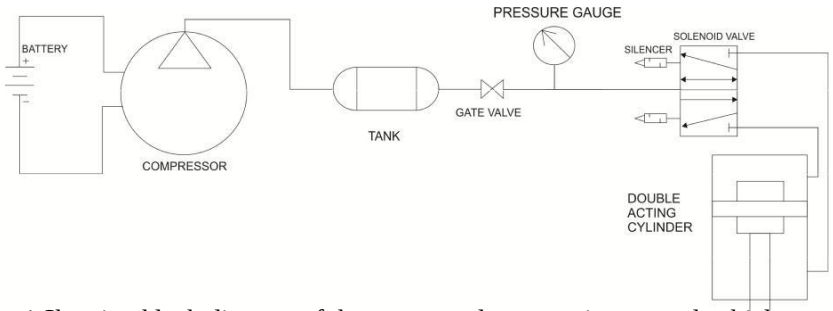


Fig.4 Showing block diagram of the conceptual pneumatic actuated vehicle

The Compressor is switched ON, powered by a 8-12 Amp battery which produces a pressure of 5 bar .The pressurized air is stored in the storage tank through the hose pipes. This air is supplied to the pneumatic drive to actuate the system through solenoid valve controller (5/3 = 5 way and 3 positions) which consist of 1-inlet port, 2-cylinder ports and 2-exhaust ports fitted with mufflers to reduce the noise. The mufflers or silencers are also used to control / regulate the speed of the air flow to the double acting cylinder. This setup is semi-automated by means of electronics, which is controlled or operated by means of Bluetooth signals at proper interval of time .The connecting rod connects the pneumatic drive head and the crank shaft. The controlled air flow is supplied to the double acting cylinder through hose pipe. The valve timing is set and controlled by the solenoid valve. The slide crank mechanism enables the crank to gain rotary motion, this rotary motion is supplied to the sprocket using chain drive. This powers the rear wheel to produce motion.

5.0 MATERIAL SELECTION AND DESIGNING METHOD:

5.1 MATERIAL/PART SELECTION:

Here all materials or part is selected according to availability, thermal consideration and cost. Most of part are available easily and no need to pay extra attention to any part or material.

Here list of needed parts/materials is shown below, as in this project size is not matter because you can change it according to your requirement.

1 Pneumatic Cylinder
2 Sprocket
3 Compressed Air Tank
4 Solenoid Valve
5 Wheels
6 Steering
7 Crankshaft
8 Polyurethane Tube
9 Chain
10 Knuckle Arm
11 Bearing Housing

5.2 DESIGNING METHOD:

The design a pneumatic vehicle total design work has been divided into two parts mainly,

1. System Design
2. Mechanical Design

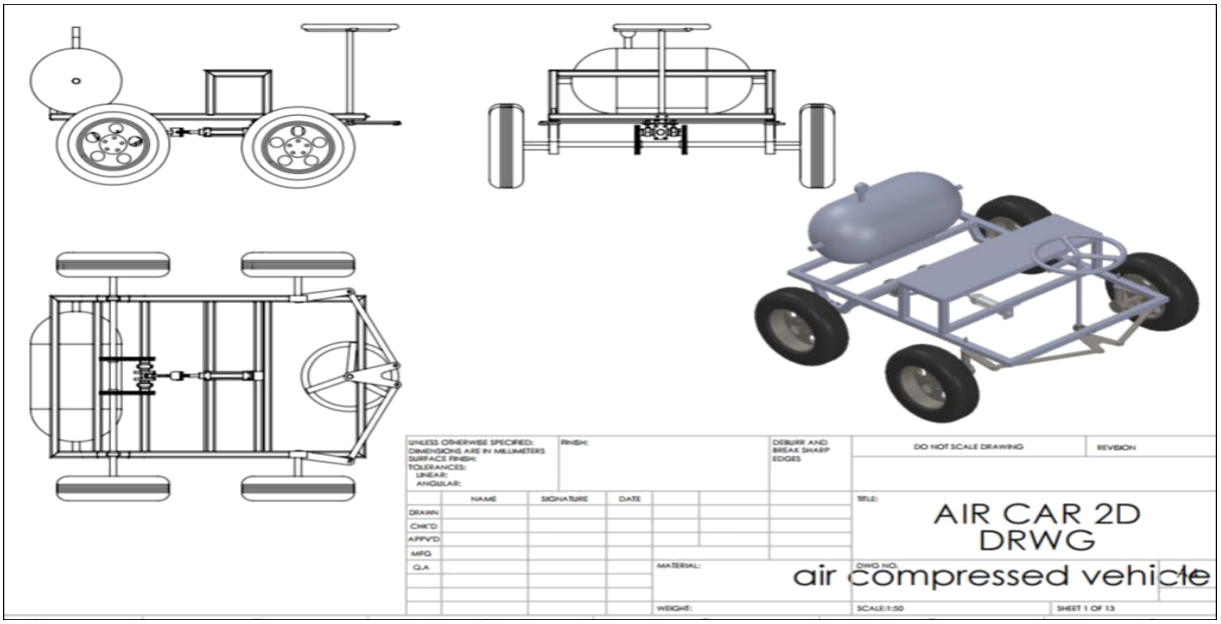
System design mainly concern with the various physical concerns and ergonomics, space requirements, arrangements of various components on the main frame of machine, number of controls, positions of this controls, ease of maintenance, scope of further improvements, height of machine components from the ground etc. In mechanical design, the components are

categorized into two parts.

1. Design Parts
2. Part to be purchased

For design parts, detailed design is done and dimensions thus obtained are compared to next highest dimensions which are readily available in the market.

6.0 FABRICATION PROCIDURE AND ASSEMBLY:



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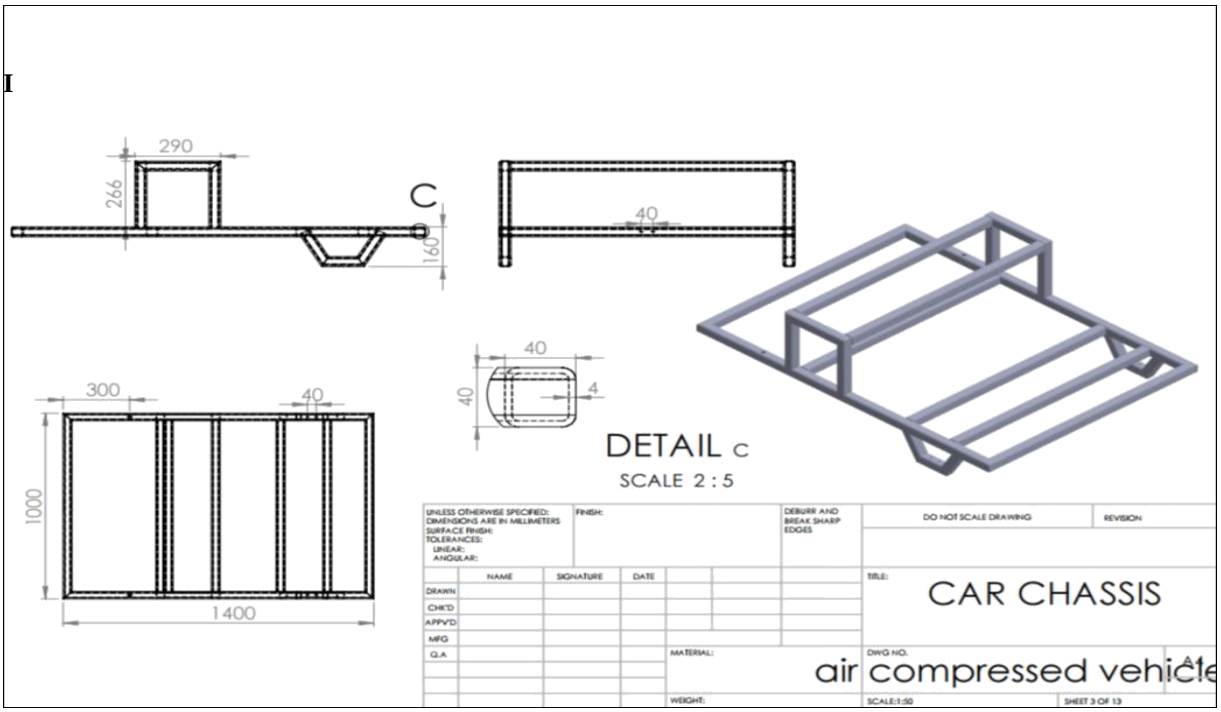

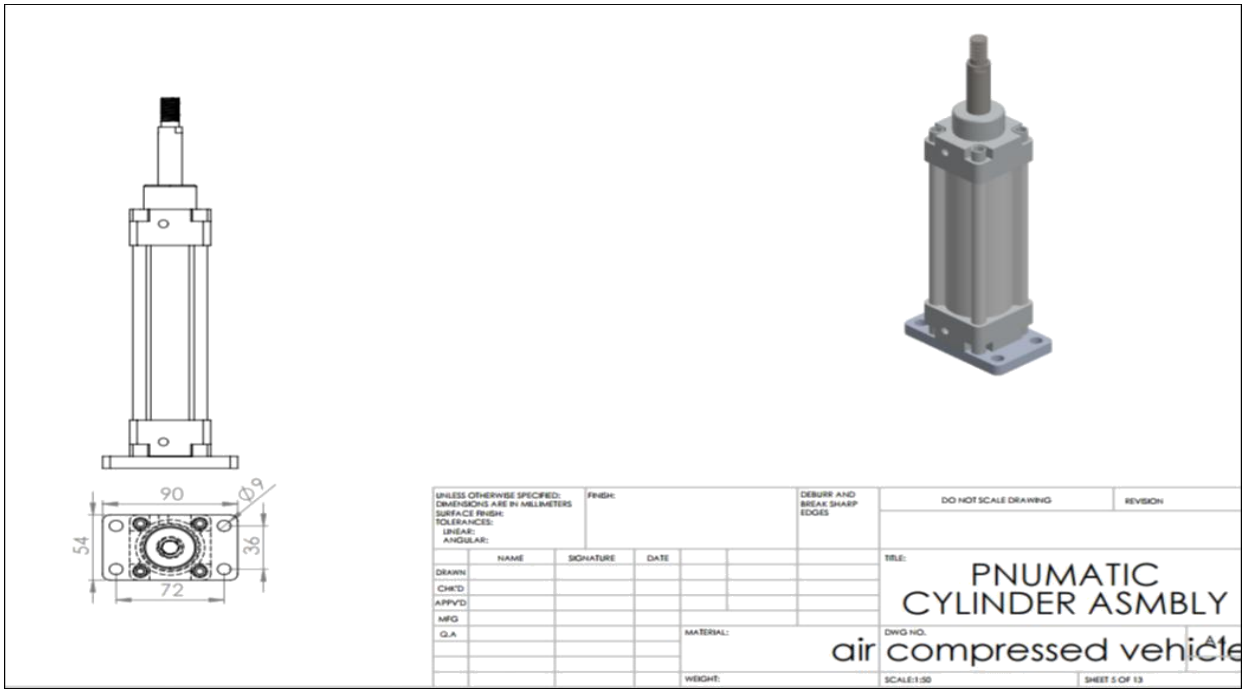

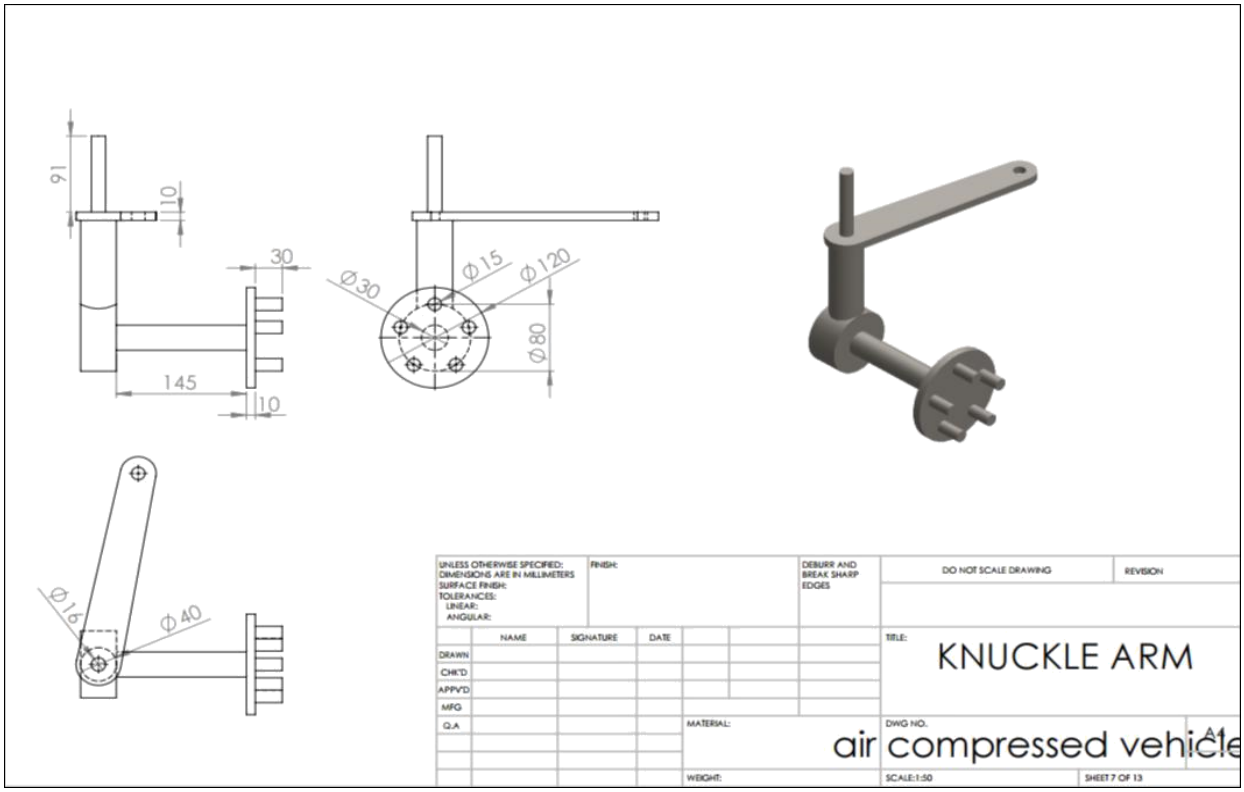

7.0 RESULTS & PERFORMANCE ANALYSIS:

Even though the vehicle is in early stage of development, it holds a lot of promise and provides scope for further research. Thus we designed and manufactured the vehicle model which is ecofriendly and does not cause pollution like internal combustion engines. This vehicle will help in reducing the problem of global warming since internal combustion engines contribute to the problem the most. It uses non-conventional energy source i.e. atmospheric air. This will help to save the nonrenewable sources of energy. So, the successful policy for the 21st century will depend on the non-conventional sources. Pneumatic vehicle can prove solution to depleting natural resources and can be the technology of tomorrow. In this project a model of pneumatic vehicle is designed and manufactured. The volume of cylinder is 0.0628lit. and is store at pressure of 1-10bar. Once the compressed air is filled in tank the vehicle can move up to a distance of 1.52km.

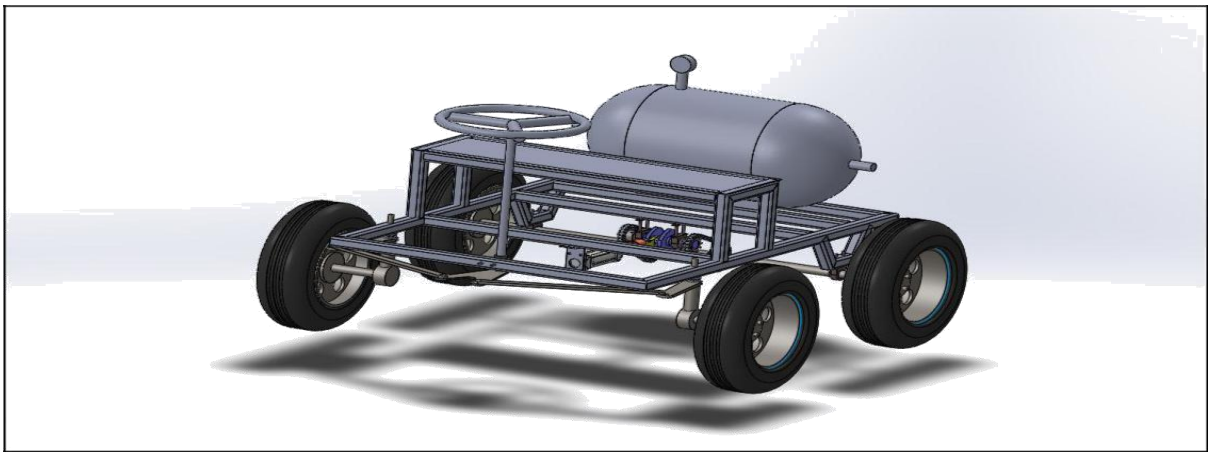

Fig7(a). Front View Of Pneumatic vehicle

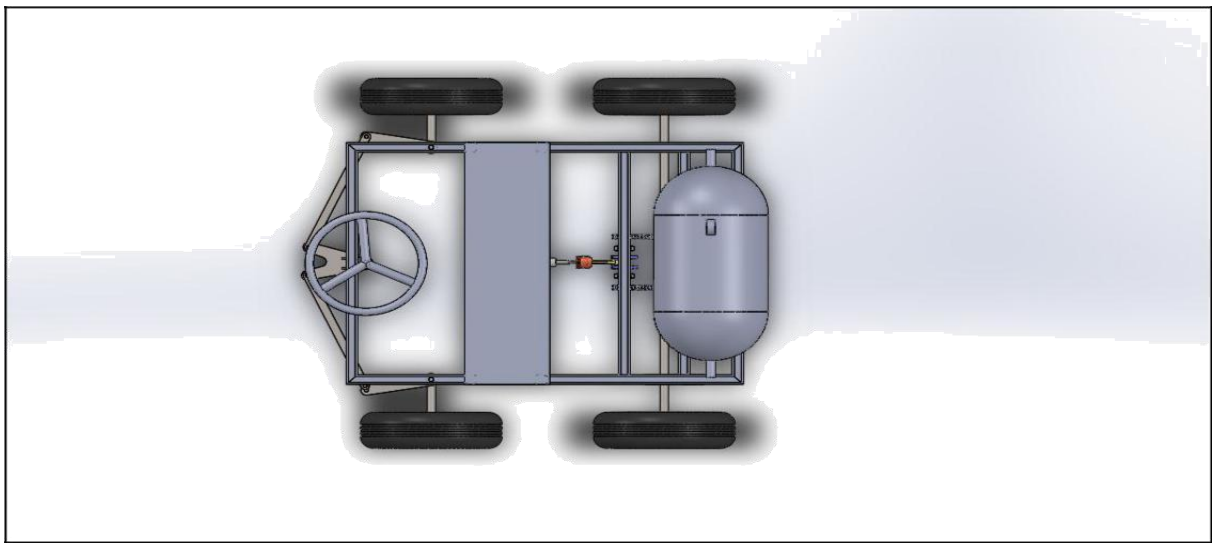

Fig.7(b) Top View of Pneumatic Vehicle

8.0 FUTURE SCOPE:

It is always consider that every machine should perform satisfactorily but due to theoretical assumptions differ from actual practice so to overcome this drawback some modifications are needed. These modifications may be in design or may be in performance or may be in features of product. It is also not possible to develop a model which works on ideal conditions. According to customer requirement, market value & necessity of product some changes may be done. These changes may vary according to condition. The future modification is done for improving performance of product & increasing the life of product. For pneumatic vehicle there are lots of scopes to modify the performance, features design.

8.1 Load Carrying Capacity:

As we know the load carrying capacity of pneumatic vehicle is less. It is due to the low torque developed at low pressure. As the torque is increased the load carrying capacity is also increased this may be done by increasing the pressure in the air receiver tank. This is one of the major & very important modification can be done in the pneumatic vehicle.

8.2 Low Speed of Vehicle:

The name itself indicates the function of vehicle but the major drawback of this; vehicle is not running continuously more than 20kmph.To overcome this drawback we can get a continuous motion with more speed by using the solenoid valve with reset timer. Using this mechanism vehicle will move continuously without stop & we can achieve the speed more than 20kmph.

8.3 Large Storage Space:

As we know for working the pneumatic vehicle we require an initial compress air in air receiver tank. This tank is heavy in weight & big in size. Due to this the space as well as the cost is increase. This is not feasible. To overcome this drawback we can use the low weight metal with high tensile strength & to decrease the size with require press we can use the bio-fuel.

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