Solar Powered Compressed Air Engine

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Abstract – The world can't be imagined without IC Engines, as their applications are wider in various fields. And mainly used input for this engines are fossil fuels. But the challenge in this is decreasing rate of resources. The fossil fuels may not be available after some years if they used in the same way. Not only the fossil but also the electric power is the non renewable energy. Hence the ultimate solution to the present day scenario is to tap the solar energy and be used for propelling the engine. In this research paper solar radiation are convert to useful work to compress atmospheric air. And compressed air in turn propels the Engine. Paper concentrates to run the engine without fossil fuels or electricity.

Key words – IC Engines, fossil fuels, non renewable energy, Compressed air

INTRODUCTION

In today's motorized life, It's difficult to live without motor (Engines) and the main source of its input power is fossil fuels & partly electric power. In future these fuels or electricity may not be available widely as they are non renewable energies. So, it may be difficult to use engine with the fuels. Not only the problem of lack of resources but also but also they pollutes the environment. If the fossil fuels are used in this way for some more years, It may difficult to breath in the future and many things which are harmful to the earth may happen like global warming .this may leads in danger to the lives of creatures. [1]

To solve this problems compressed air technology (CAT) was invented, and again the problem in this is input power. The air may be freely available in the atmosphere, but it needs to be compressed to use and the power it needs for compression is electrical energy, which is also a non- renewable energy.

The Solar powered engines are also invented, but the acceleration we can achieve with that is comparatively less. The present paper or model Named "Solar powered Compressed air engine" is introduced to resolve this problem.

COMPONENTS

The main components are

1. Engine
2. D.C. Compressor
3. Solenoid valve
4. Temps circuit
5. Solar unit

ENGINE

A 125cc single cylinder engine is used. The Specifications of the engine used are

Bore **x** Stroke (mm) =	52.4 x 57.8
Engine Type =	2-valve OHC single
Max. Torque =	11.2Nm / 6250rpm
Transmission =	4 Gears

COMPRESSOR

A High Power Model 300psi & an Extra High Power Motor which runs on 12v D.C Power has to be used. As shown in Fig.1 and the detailed specifications are

Output volume- 25L/min
Max air pressure- 300psi
Size- Approx 14*12.5*8cm / 5.5*4.9*3.1 inch

Fig.1 High power model compressor

A **solenoid valve** is an electromechanically operated valve shown in Fig.2, the **valve** is controlled by an electric current through

a **solenoid**: in the case of a two-port **valve** the flow is switched on or off; in the case of a three-port **valve**, the outflow is switched between the two outlet ports. **Solenoid valves are used at inlet and outlet valves to** supply the desired quantity of air into valves, as it may be difficult for the opening & closing of valves by resisting the pressurised air.

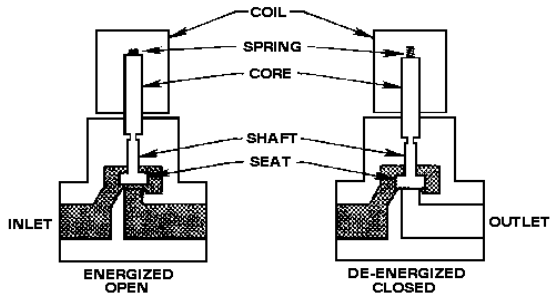

Fig.2 solenoid valve

Temps Circuit

Temps circuit is a timing circuit which is used to operate the solenoid valves by supplying the electric current at appropriate time as shown in Fig.3. This circuit is designed on PCB board which includes a microcontroller and programming is done to it.

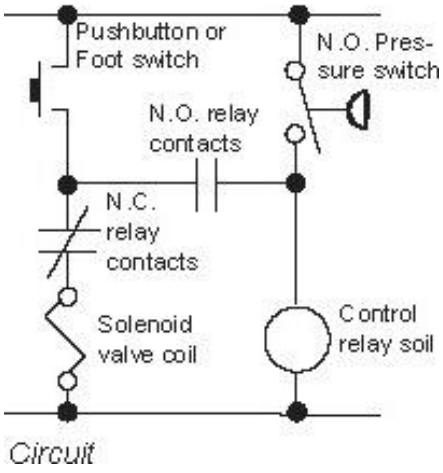

Fig.3 Temps Circuit

Solar Unit

A solar unit is used to generate the electric power required to run the D.C. Compressor at 12V. The solar unit is shown in Fig.4.

Fig.4 **Solar Unit**

MODIFICATIONS

Some modifications are needed to run the 4-stroke engine by using air, they are

Modifications in Engine

The parts to be modifications in engine are cam shaft, Spark plug

Cam Shaft

The camshaft is to be modified to open and close the inlet and outlet valves as required. The valves are to be opened and closed for every two strokes, where these opens and closes for every four strokes in the engine before modification. Two cam lobes are added to the opposite sides of the existing cam lobes. [5]

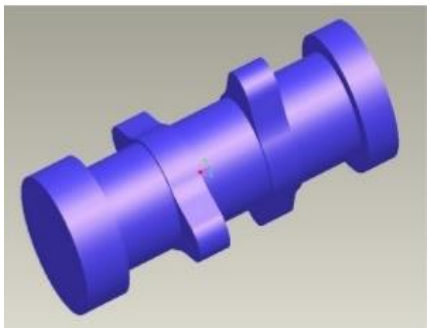

Fig.5 Cam Shaft

Or crank shaft gear is to be modified by decreasing the No. of teeth on it. The no. of teeth on crankshaft gear is to be made equal to the no. of teeth on cam shaft, to rotate the one cam shaft for once by the one revolution of crank shaft. Where in previous case two rotations of the crank shaft is equal to the one rotation of the cam shaft, referred to Fig. 5.

Spark Plug

Spark plug is to be made dummy as no combustion is taking place.

Modifications in Compressor

Modification may not be needed for the engines of 125cc-150cc. If the engine of more displacement

is used then more pressure is needed for which dc compressors are not available. [4] So, the compressor is to be coupled with low pressure dc compressor. Like, 300 psi compressor outlet is to be coupled with 200 or 100 psi compressors inlet as needed.

WORKING

Firstly, the solar unit will generate the power and runs the compressor .The compressed air will flow from outlet of compressor to the solenoid valve and then passed to the inlet valve of the engine. Only two strokes are executed by the piston in one cycle. Namely they are Intake stroke and Exhaust stroke.

Intake Stroke

In this stroke cylinder sucks the compressed air at 300 psi when inlet valve opens where exhaust valve closes by the action of cam shaft [3]. The pressurised air will force the piston to move downwards, resulting in the travelling of piston from TDC to BDC, referred to Fig. 6.

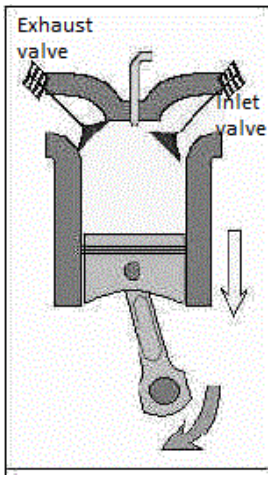

Fig.6 Intake Stroke

Exhaust Stroke

In this stroke the piston moves from BDC to the TDC by the weight of the flywheel. The exhaust valve and solenoid valve opens where inlet valve closes and the air in the cylinder will be exhausted to the atmosphere. Fig.7

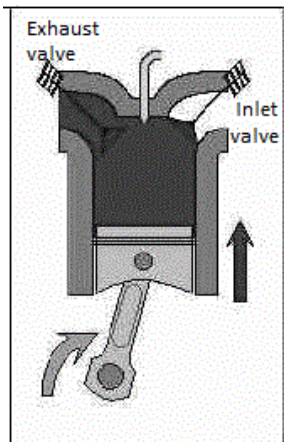

Fig.7 Exhaust Stroke

As the compressed air is only the charge, there is no need of fuel to be mixed. So carburettor is eliminated in this engine.

The cam shaft is driven by the crank shaft by timing chain and rotates as crankshaft rotates; when the follower touches the lobe of the cam then it lifts the inlet or outlet valve up. If follower came in to contact with the dwell side of the cam, the inlet or outlet valve closes. [2]

Comparison with 4 stroke & CAT engine

4-Stroke Engine	**CAT Engines**	**SPCA Engine**
Fuel + Air As charge	The compressed air is the charge	The compressed air is the charge
No compressor	Compressor requires electric energy	Compressor runs on solar energy
Pollution is more	No pollution as the input is air	No pollution as the input is air
Carburettor is used	Carburettor is not used	Carburettor is not used
Spark plug Needed	Spark plug not needed	Spark plug not needed
Power generated once in 4 strokes	Power generated once in 2 strokes	Power generated once in 2 strokes

Piston Executes 4strokes in a cycle	Piston Executes 2strokes in a cycle	Piston Executes 2strokes in a cycle
Output power is more	Output power is less compared with 4 stroke engine	Output power is less compared with 4 stroke engine
Efficiency is less	Efficiency is more	Efficiency is more
Not Economical compared with CAT & SPCAE	Less Economical compared with SPCAE	Economical

ADVANTAGES

1. No cost to run the engine.
2. Eco – Friendly.
3. Heat generated is less.
4. Use of Carburettor & Spark plug is eliminated.
5. The exhausted air from engine can be used for other processes like cleaning and filling the air in tires.

DISADVANTAGES

1. More Noisy.
2. Initial Cost is high.

CONCLUSION

This engine uses solar energy which is freely available in the environment. Even solar Engines are introduced they are comparatively poor in generating power and acceleration.

This may helps to fight with global warming as it delivers the air at comparatively lesser temperature, which results in cooling of the atmospheric air. This will be the good alternative for the fossil fuels both economically as the cost of air is 0 and environmentally as it doesn't exhaust the harmful gasses.

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