

AN ALTERNATIVE POWER TRANSMISSION MECHANISM TO CONTROL VIBRATIONS IN IC ENGINES

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ABSTRACT

A crank shaft is used to transmit power from connecting rod to the flywheel. In internal combustion engines the torque generated is not smooth. The weights suspended in the crankshaft leads to a centrifugal action. Both the above mentioned things results in torsional vibration of the crankshaft. This torsional vibration is not at all good as far as the working of the engine is concerned. The torsional vibration leads to seat vibrations and noise at certain speeds which reduces the comfort. Comfort is an important factor in the commercial production of automobiles. Human body is also not designed to tolerate the vibrations for a longer period of time and it will take its toll on the body. Further it may lead to failure of various components of the engine as well as the automobile. Therefore controlling the torsional vibration is of at most important. There are many ways of controlling the torsional vibration. But in this paper an alternative power transmission mechanism is proposed to limit the torsional vibration produced.

Keywords: crank shaft, torsional vibration.

INTRODUCTION

Every material system containing individual mass and stiffness distribution is susceptible to vibrate. These vibrations can be caused either by single impulse of load or a periodic load. In the first case a free vibration occurs and in the second case a forced vibration is achieved. A free vibration is not significance in technical applications because there is always a periodic load, which causes a forced vibration.

Torsional vibration of the crankshaft is one of the most important problems to be considered while designing the engine. The weight of the piston assembly and the crank web in combination with the non-uniform torque produces torsional vibrations. If not completely balanced this torsional vibration lead to discomfort and even may lead to failure of the crank shaft. There are many different methods to reduce the intensity of vibration. Some of them are the following.

Viscous dampers consist of an inertia ring in a viscous fluid. The torsional vibration of the crankshaft forces the fluid through the narrow passages that dissipates the vibration as heat. The viscous torsional damper is analogous to the hydraulic shock absorber in a car's suspension. Tuned absorber type of "dampers" often referred to as a harmonic dampers or harmonic balancers.

The damper uses a spring element and an inertia ring that is typically tuned to the first torsional natural frequency of the crankshaft. This type of damper reduces the vibration at specific engine speeds when an excitation torque excites the first natural frequency of the crankshaft, but not at other speeds.

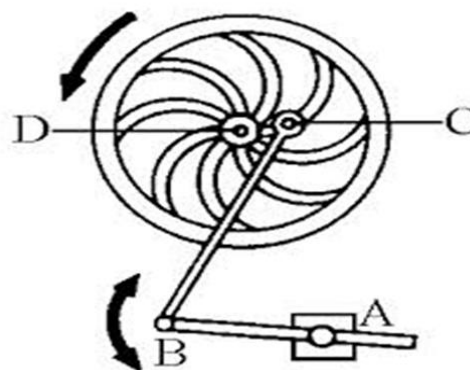
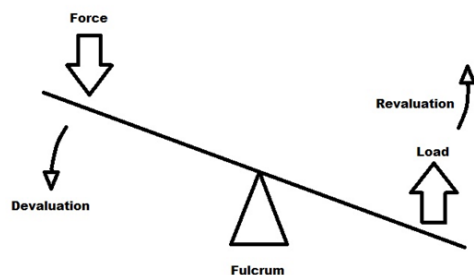
This type of damper is analogous to the tuned mass dampers used in skyscrapers to reduce the building motion during an earth quake. In addition to this proper balancing of weights in the crankshaft also reduces torsional vibration.

PROPOSED MECHANISM

The combustion in the internal engine produces a thrust which causes the piston and connecting rod to reciprocate. This reciprocating motion is converted into rotary motion in the crankshaft, which causes it to rotate and transmit power to the flywheel. Due to this torsional vibration is induced.

The following mechanism is proposed in order to avoid this. In this mechanism the reciprocating motion of the piston is converted into the seesaw motion first. Then the seesaw motion is converted into rotary motion. The use of seesaw mechanism eliminates the torsional vibration produced. This method is better explained by the following illustration. Consider a two stroke two cylinder engine. Let one cylinder be placed at one end of the seesaw mechanism and the other cylinder placed at the other end. Here the cylinders are fired alternatively. Thus the reciprocating motion of the piston and connecting rod is used to move the seesaw blade up and down.

To drive the flywheel this up and down motion should be converted into rotary motion. This can be done using the mechanism that is used in the pedal type sewing machine.



CONCLUSION

This mechanism can be used in engines to reduce torsional vibration, since it does not have a crankshaft. By using this method we can also reduce the weight of the engine. The major disadvantage of this mechanism is, it cannot be used in a single cylinder engine. But it also has a major advantage that the engine can be operated at any desired position.

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