On the Investigation of Reducing the Motorcycle Body"s Vibration due to Its Engine

蕭士奇、陳照忠

E-mail: 8402632@mail.dyu.edu.tw

ABSTRACT

The most popular short-distance vehicle is a single-cylinder motorcycle. Becauce of being restricted by space and other conditions, the shaking force and shaking momment which are induced by the motion of slider-crank mechanism can not be reduced simply by a balancer shaft. We must search other approaches for reducing the chassis vibration due to the engine. In this investigation, we propose two successive approaches to solve the problem. The first approach is to adjust the crank- balance mass in order to make the cycling of the shaking force to shape into a line. The second approach is to make use of the percussion principle, and to change the arrangement of the engine-suspension mechanism in order to reduce the vibration of the chassis. In the second approach, we present a four-link model and a quasi-compound-pendulum model for reducing the chasis vibration, and optimize these models. In the optimum four-link model, the included angle of the two links which suspend the engine will be 180 degrees if it is not restricted by the reasonable form of the engine-suspension mechanism. But the reasonable included angle usually does not exceed 90 degrees. In the optimum quasi-compound-pendulum model, the extention line of link 2 and the line from the percussion center to the rotation center of the engine overlap. For application, we can apply the four-link model to the motorcycles such as HONDA 100, and the quasi-compound-pendulum model to the motorcycles such as SCOOTER. In addition, there is a sufficiently strong torsional spring between link 2 and the chassis to constrain the engine- suspension mechanism. The torsional spring will obviously affect the vibration of the chassis, and its optimum value of spring constant is related with the rotational speed of the engine. We can obtain the suitable value of the torsional spring constant by running the simulation program of the engine-suspension mechanism by try- and-error method.

Keywords : precussion principle ; four-link model ; quasi-compound-pendulum model

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