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(54) AN ANTI-VIBRATION MOUNTING

(71) We, TOKAI RUBBER INDUSTRIES LIMITED, and TOYOTA JIDOSHA KOGYO KABUSHIKI KAISHA, both Japanese Corporations, of: 3600, Asa Utazu, Chaza Kitayama, Komaki City, Aichi Prefecture, Japan, and 1, Toyotamachi, Toyota City, Aichi Prefecture, Japan, respectively, do hereby declare this invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an anti-vibration mounting and, in particular, to such a mounting for a vibrating body such as an engine.

Referring to Figure 1 of the accompanying drawings, a number of buffers C each comprising a rubber block C₁ sandwiched between and attached adhesively to metal plates C₂, C₃, are used conventionally for supporting an automobile engine A on a car body at the front and rear and on each side thereof. A metal plate C₂ of buffer C is attached to an upwardly inclined protrusion of the car body B and another metal plate C₃ is attached to engine A to support it in position. In such a support, engine A is supported so that the vertical plane D-D through the centre of gravity of engine A intersects upwardly and obliquely with the main axis of buffer C, i.e. with a high rigidity axis E-E of block C. Hence, the downward exciting force due to the vibration of engine A will have a downward component and an outward component, and the upward exciting force will have an upward component and an inward component, resulting in enhancing the vibration. In certain car bodies, however, a secondary vibration may be induced perpendicularly to each component due to the inherent anisotropy of the car bodies and the primary and secondary vibrations of each component

may together produce resonance of the car bodies in particular engine speed ranges to cause loud noise.

The buffer is fixed to the engine A and car body B only by a rubber block C₁ which is sandwiched between and adhered to metal plates C₂, C₃ by the vulcanization. There is therefore the danger that either metal plate C₂ or C₃ will be stripped from block C and consequently that the engine A will become detached from car body B when for example, the car body is accidentally inverted.

One object of the present invention is to provide an anti-vibration mounting especially for engines which avoids the foregoing disadvantages of conventional supports.

According to this invention we propose an anti-vibration mounting wherein the body to be mounted is supported by symmetrically arranged anti-vibration buffers, each comprising a shaft, a hollow cylinder surrounding the shaft in spaced relation therewith and an elastic member between the interior surface of the cylinder and the exterior surface of the shaft, the buffer having an axis of high rigidity and an axis of low rigidity in a plane perpendicular to the longitudinal axis of the shaft, and means for connecting the shaft to one of the body or a support therefor and the cylinder to the other of the body or support so that the axis of high rigidity intersects a vertical plane through the centre of gravity of the body at a position below the intersection with the vertical plane of the axis of low rigidity.

In the accompanying drawings:—

Figure 1 is a front view of a prior art anti-vibration engine mounting;

Figure 2 is an enlarged front view of an embodiment of an anti-vibration buffer for an automobile engine mounting, according to the present invention;

Figure 2A is a similar view of another embodiment of the buffer according to the present invention;

Figure 3 is a plan view of the embodiment of Figure 2;

Figure 4 is a front view of an anti-vibration automobile engine mounting according to the present invention.

Embodiments of the invention will now be described by way of example with reference to Figures 2 to 4 of the accompanying drawings.

In the attached drawings, buffer F comprises a metal shaft 1, a hollow cylinder 2 also of metal, surrounding the shaft 1 in spaced relation thereto and an elastic member 3 preferably of rubber, interposed between the exterior surface of shaft 1 and the interior surface of metal cylinder 2. The rubber member has a plurality of holes 4 extending parallel to the longitudinal axis of shaft 1 to define two main axes E-E and G-G which intersect at right angles near the centre of the metal cylinder in a plane perpendicular to the axes of shaft 1 and metal cylinder 2 and along which the buffer has different rigidities.

After the rubber member 3 has been adhered to shaft 1 and metal cylinder 2 by vulcanization, the metal cylinder is drawn longitudinally to enhance the durability of rubber member 3 and a sheath 5 is closely fitted around the cylinder 2 so as to maintain the member 3 under compression.

Sheath 5 has welded thereto brackets 6 to be mounted on car body B and engine A, the brackets 6 being disposed so that direction E-E, having the higher rigidity intersects the vertical plane D-D through the centre of gravity of engine A below the intersection of direction G-G, having the lower rigidity with vertical plane D-D. Shaft 1, is connected to engine A by means of a bolt 8 passing through shaft 1 and brackets 7, as shown in Figure 4.

Alternatively, shaft 1 may be connected to car body B and sheath 5 to engine A provided that direction E-E having the higher rigidity intersects the vertical plane D-D passing through the centre of gravity of engine A, below the intersection of direction G-G with vertical plane D-D as shown in Figure 2A.

Moreover, the rubber member may be built from combination independently formed rubber blocks.

As a result of such a structure as disclosed hereinbefore, the downward exciting force due to vibrations of engine A introduces a downward component and an in-

ward component with respect to the car body and the upward exciting force, an upward component and an outward component with respect to the car body at buffer F so that the primary vibrations due to such components, and the second vibrations, due to the anisotropy inherent to the car body, are sinergetically reduced to make the resultant vibration less. Hence, while the vibration of the engine is transferred to the car body, the resonance of the car body can be prevented, so that the noise does not suddenly become loud when the engine speed reaches a critical value.

Even if the rubber member is accidentally stripped off between the shaft connected directly to the engine and the sheath connected to the car body, the engine will not become detached from the car body due to the fact that the shaft 1 passing through metallic cylinder 2 is attached at each end of bracket 7.

WHAT WE CLAIM IS:—

1. An anti-vibration mounting wherein the body to be mounted is supported by symmetrically arranged anti-vibration buffers, each comprising a shaft, a hollow cylinder surrounding the shaft in spaced relation therewith and an elastic member between the interior surface of the cylinder and the exterior surface of the shaft, the buffer having an axis of high rigidity and an axis of low rigidity in a plane perpendicular to the longitudinal axis of the shaft, and means for connecting the shaft to one of the body or a support therefor and the cylinder to the other of the body or support so that the axis of high rigidity intersects a vertical plane through the centre of gravity of the body at a position below the intersection with the vertical plane of the axis of low rigidity.

2. A mounting according to claim 1 wherein each elastic member has a plurality of holes extending parallel to the longitudinal axis of the shaft.

3. A mounting according to claim 1 or claim 2 wherein each elastic member is adhered to the said surfaces between which it is compressed by vulcanization.

4. A mounting according to any one of claims 1 to 3 wherein each buffer further comprises a sheath fitted tightly around the exterior surface of the metal cylinder.

5. An anti-vibration mounting according to any one of claims 1 to 4 wherein the connecting means comprises one or more brackets connecting the shaft with the body and one or more brackets connecting the

metal cylinder with the support.

6. An anti-vibration mounting according to any one of claims 1 to 5 wherein the connecting means comprises one or 5 more brackets connecting the shaft with the support and one or more brackets connecting the metal cylinder with the body.

7. An anti-vibration mounting constructed and arranged substantially as 10 hereinbefore described with reference to and as illustrated in Figures 2 to 4 of the

accompanying drawings.

8. An anti-vibration mounting according to any one of claims 1 to 7 wherein the body is an engine. 15

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FIG. 1
PRIOR ART

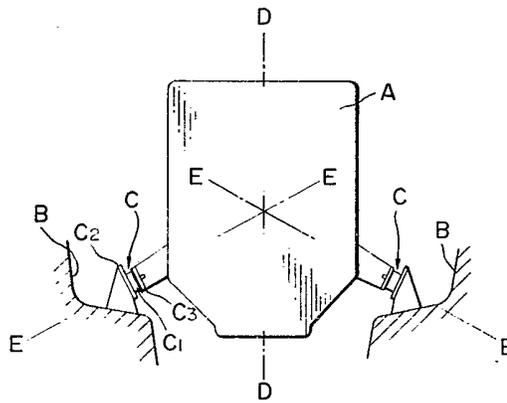


FIG 2A

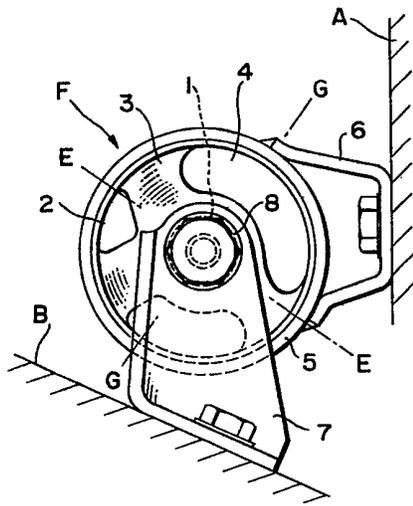


FIG 2

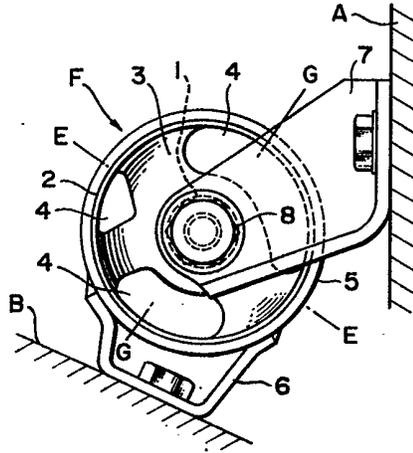


FIG 3

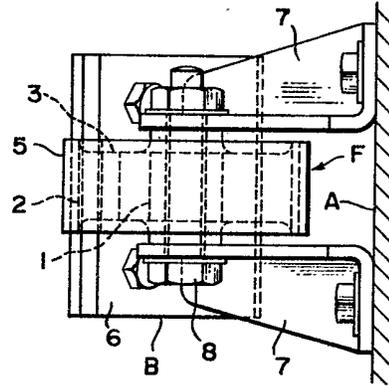


FIG 4

