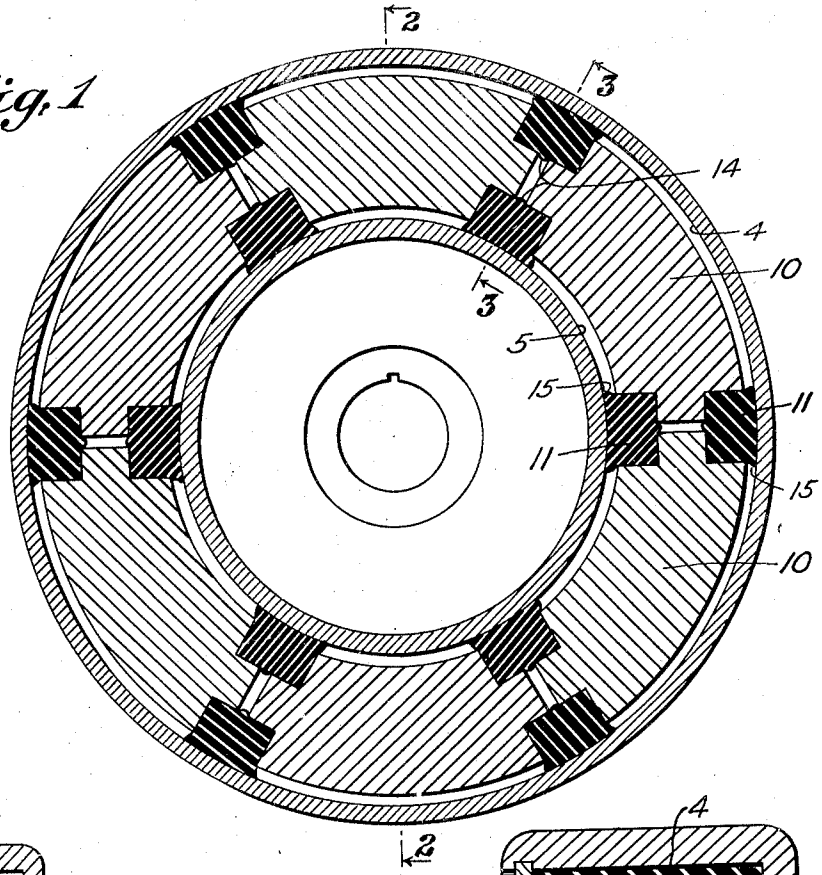
April 23, 1940. J. L. STRASBURG ET AL 2,198,135

ENGINE VIBRATION ELIMINATOR

Filed Nov. 15, 1938 2 Sheets-Sheet 1

Fig. 1



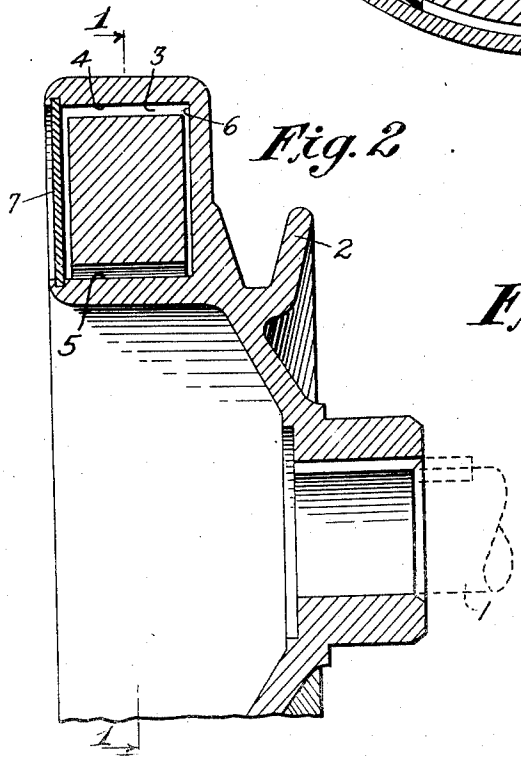
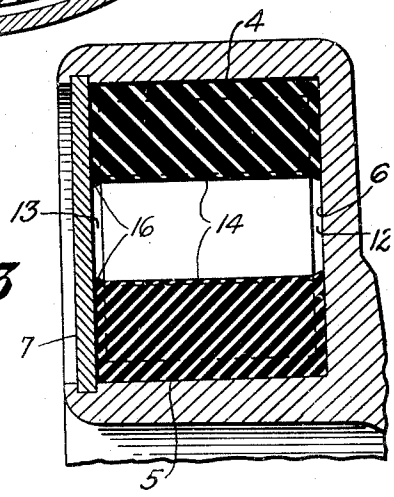


Fig. 2

Fig. 3



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ENGINE VIBRATION ELIMINATOR

Filed Nov. 15, 1938 2 Sheets-Sheet 2

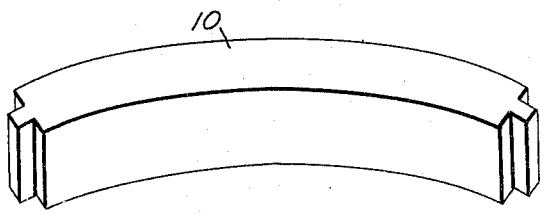


Fig. 4

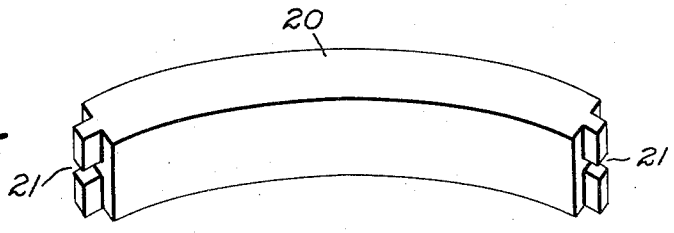


Fig. 5

Fig. 6

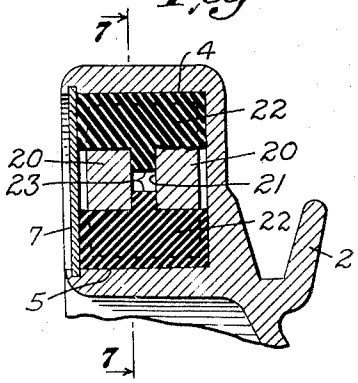
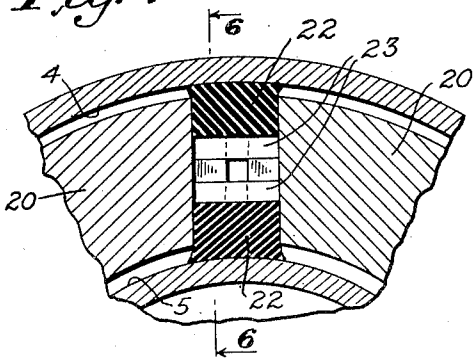


Fig. 7



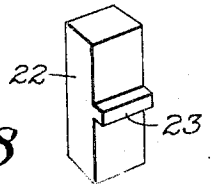


Fig. 8

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2,198,135

UNITED STATES PATENT OFFICE

2,198,135

ENGINE VIBRATION ELIMINATOR

Jesse L. Strasburg, South Williamsport, Frederick J. Livingston, Williamsport, and George C. Billman, Jersey Shore, Pa.

Application November 15, 1938, Serial No. 240,596

13 Claims. (Cl. 74—574)

This invention relates to engine vibration eliminators and has for its object to provide a construction which is simple in parts and more efficient in operation than those heretofore proposed.

With these and other objects in view the invention resides in the novel details of construction and combinations of parts as will be disclosed more fully hereinafter and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification and in which like numerals designate like parts in all the views—

Fig. 1 is a vertical sectional view of a device made in accordance with this invention as applied to a pulley, said view taken as on the line 1—1 of Fig. 2 and looking in the direction of the arrows;

Fig. 2 is a sectional view taken as on the line 2—2 of Fig. 1 and looking in the direction of the arrows;

Fig. 3 is an enlarged transverse sectional view taken as on the line 3—3 of Fig. 1 and looking in the direction of the arrows;

Fig. 4 is a perspective view illustrating one of the segmental weights shown in Fig. 1;

Fig. 5 is a similar perspective view of a modified form of segmental weight;

Fig. 6 is a sectional view taken as on the line 6—6 of Fig. 7 and looking in the direction of the arrows, and illustrates the employment of the modified segmental weight shown in Fig. 5;

Fig. 7 is a vertical sectional view taken as on the line 7—7 of Fig. 6 and looking in the direction of the arrows; and

Fig. 8 is a perspective view illustrating a modified form of spacer for use with the segmental weight shown in Fig. 5.

The device of this invention is designed for application to engines or other mechanisms in which objectionable vibrations occur, and tends to substantially eliminate such objectionable vibrations, resulting in a smoother operation of the motor or mechanical part. Therefore the invention is applicable to various parts of mechanical structures but, for the purpose only of illustration, it is shown here as used in connection with a fan pulley intended to be mounted upon an automobile engine shaft.

The shaft is indicated by the numeral 1 and keyed or otherwise secured thereto is the pulley generally identified by the numeral 2, but this pulley has attached thereto or formed in a face thereof an annular chamber indicated at 3 and having the outermost cylindrical concave wall surface 4, the innermost cylindrically convex wall surface 5, and the flat wall surface 6, the last of which surfaces lies in a plane substantially at right angles to the common axis of the cylindrical surfaces. A cover plate 7, provided to close the chamber 3, may be secured in any suitable fashion.

Within the chamber there is provided a plurality of segmental weights 10 of any suitable metal, separated from each other by a plurality of resilient spacers 11, which spacers also separate the weights from the outermost and innermost cylindrical surfaces 4 and 5 respectively. Each weight is formed substantially as shown in that each is of an acruate extent substantially no greater than the radius of the outermost cylindrical surface of said chamber, wherefore a minimum of six weights may be provided in the smaller sized chambers; larger chambers may have a greater number of weights as found most desirable. Each segmental weight has outer and inner cylindrical surfaces which are substantially coaxial with the corresponding surfaces of the chamber, each weight is of a thickness to provide such clearance with the flat surface 6 and the cover plate 7 as to permit movement of the weight radially of the chamber, each weight is of a radial dimension less than the corresponding dimension of the chamber, and further each weight is formed with its corners cut out or rabbeted to form a pocket or recess for receiving a corner of a rectangular spacer 11, as clearly indicated in Fig. 1, all of such pockets being of substantially the same shape and dimension so that no particular spacer is required for any one pocket; in other words the spacers may be interchangeable.

The size of each spacer is such that it will extend out of its pocket in one direction beyond the cylindrical surface of its associated weight, and this extent is such that, when the weights and the spacers are assembled in the chamber 3, the spacers will be under compression in a direction radial of the chamber and they will support the weights in spaced relation to the cylindrical surfaces of the chamber.

Further, another dimension of each spacer is more than twice the depth of the rabbet or pocket formed in the weights wherefore, when all of the weights and spacers are correctly assembled, each spacer will be under compression in a direction circumferential of said chamber and the adjacent ends of the weights will be spaced from each other. Additionally, the third dimension of each spacer is slightly greater than

the distance from the cover plate 7 to the flat surface 6 of said chamber wherefore, when the cover plate is secured in place, the spacers will be compressed and this compression will have resultants in both circumferential and radial directions. Obviously, the best results may be had when using spacers of uniform or homogeneous composition so that compression in three directions is made possible and hence some elastic material such as rubber has been found very suitable. There are other yieldable media that could be used such as certain woods, fibrous materials, etc. and in some instance metallic springs may be found highly advantageous.

A peculiar feature of this invention is the fact that, after assemblage, it will be found that the weights are substantially if not absolutely free floating on their resilient spacers in that they are neither in contact with each other nor are they in contact with any part of the chamber. From Fig. 1 it will be perfectly obvious why there is no metal to metal contact in circumferential or radial directions, and in Fig. 3 the side clearances have been shown at 12 and 13. In other words the thickness of each weight is such as to permit a clearance of approximately 1/64 of an inch on each side thereof with the surface 6 of the chamber and with the cover plate 7, which clearance is maintained during the operation of the device. In fact, the compression of the spacers is sufficiently great to cause a "bulge" to develop at the spaces between the adjacent ends of the weights (as at 14), as well as develop at the spaces between the cylindrical surfaces of the weights and the chamber (as at 15), and develop at said clearances (as at 16). Preferably the spacers 11 which are farthest from the axis of the pulley should have more resistance than those nearer said axis and, whereas this is indicated in the drawings by the difference only in weight of the cross-hatching, yet it is to be understood that this invention is not limited to the exact construction illustrated since any type of spacers is contemplated wherein the outermost will offer a greater resistance than the innermost to relative movement between the chamber and its contained weights, and this difference in resistance may be variously accomplished.

In some cases positive insurance of this free floating may be desired and therefore the construction shown in Figs. 5 to 8 is contemplated. Here a segmental weight 20 is shown which is a duplicate of the weight 10 heretofore described except that midway of each extreme end there is provided a slot or kerf 21 disposed in a plane parallel to the flat sides of the weight and thereby joining the two rabbets or pockets at an end of the weight. A resilient spacer 22 is provided which is a duplicate of the spacer 11 except that across one face thereof there extends a rib 23 midway from the ends, and this rib is adapted to engage the kerfs such as 21 in the ends of two adjacent weights. At the juncture of each pair of segmental weights, one or both of the spacers may be provided with such a rib, as found necessary in accordance with the size, weight and speed factors involved. With the employment of such coacting ribs and kerfs, the segments will be positively spaced from the flat surface 6 and the cover plate 7 to insure no contact therewith.

From what has been described above it will now be seen that the vibrations are dissipated presumably as follows. The vibration of an engine shaft has a period which is automatically transmitted to all parts associated with that shaft and therefore such period of vibration is transmitted through the pulley 2 and the spacers 11 into the segmental weights 10. However, when this occurs, the continuity of this period of vibration is broken up so that all of the segmental weights do not absorb the same vibratory deflection and consequently the inertias of said weights dampen or iron-out the objectionable period of vibration. In other words, if instead of separated segments 10 there was provided a continuous metallic ring, there would be no dampening or ironing-out because the period of vibration transmitted into any one portion of such ring would automatically and instantaneously be transmitted into all the other parts of that ring. By providing the plurality of spaced segmental weights which are in no metallic contact with each other, the deflection of any one segment is substantially independent of the deflection of another segment, and the resilient spacers aid materially in absorbing a portion of the vibration transmitted to any one segment and prevent the full transmission thereof to the next segment while permitting the free and independent movement of each segment.

When this device is assembled and the engine shaft starts to rotate, immediate rotation is given to the pulley, and substantially immediate rotation is given to the segmental weight assembly, although it may be true that the weights might have a slight lag over the rotary movement of the pulley, but this lag would exist only in the initial movement. In other words the only differential between the weight assemblage and the pulley is that which is made possible by the resiliency of the separators and, by the time the shaft reaches its intended speed, this differential for practical considerations becomes zero. The aforementioned lag does not result in any creep of the separators with respect to the cylindrical surfaces with which they are in contact, the avoidance of such creep being due to the compression in all three dimensions under which the separators are placed in the assemblage, which compression is caused by what might be termed the "over-size" of the separators with respect to the spaces they occupy.

From the foregoing description it will therefore be understood that by this invention there is provided a vibration eliminator particularly adaptable to engines or other motors and wherein there is provided a chamber, with a weight in said chamber, and means for spacing said weight from the walls of said chamber. In the more specific aspect of the invention the chamber is annular and provided with a plurality of weights, which weights are segmental in character and similar to each other, and provided with a rabbet at each of its end edges, all of the rabbets of each weight being similar, the rabbets of each weight registrable with the rabbets of the next adjacent weight. In addition, the means for spacing the weights from each other as well from the walls of the chamber, are resilient means disposed between the ends of the weights and operating upon the corners or other portions thereof, said means coacting with said rabbets and fitting each pair of registered rabbets under compression but of such dimensions as to extend beyond the limits of the rabbets. In the most limited sense, the spacing means is a resilient member having a rib engageable with the registered slots which interconnect the two rabbets at each end of a weight.

It is obvious that those skilled in the art may vary the details of construction and arrange-

ments of parts without departing from the spirit of this invention, and therefore it is desired not to be limited to the exact foregoing disclosure except as may be demanded by the claims.

What is claimed is:

1. In a device of the character described the combination of an annular chamber; a plurality of similar segmental weights in said chamber, each weight having a rabbet disposed at each of its end edges, all of the rabbets of each weight being similar, the rabbets of each weight registrable with the rabbets of the next adjacent weight; and means for spacing said weights from each other and from the walls of said chamber, said means comprising a resilient member fitting each pair of registered rabbets and extending beyond the limits thereof.

2. In a device of the character described the combination of an annular chamber; a plurality of similar segmental weights in said chamber; each weight having a rabbet disposed at each of its end edges, the two rabbets at each end of a weight being interconnected by a slot, all of the rabbets of each weight being similar, the rabbets and slots of each weight registrable with the rabbets and slots of the next adjacent weight; and means for spacing said weights from each other and from the walls of said chamber, said means comprising a resilient member fitting each pair of registered rabbets and extending beyond the limits thereof, each member having a rib engaging the registered slots.

3. In a device of the character described the combination of an annular chamber; a plurality of segmental weights in said chamber, each weight having a rabbet disposed at each of its end edges, the rabbets of each weight registrable with the rabbets of the next adjacent weight; and means for spacing said weights from each other and from the walls of said chamber, said means comprising a resilient member disposed in each pair of registered rabbets and having a portion extending beyond the limits thereof.

4. In a device of the character described, the combination of an annular chamber; a plurality of segmental weights in said chamber, each weight having a recess disposed in each end thereof, the recesses of each weight registrable with the recesses of the next adjacent weights; and means for spacing said weights from each other and from the walls of said chamber, said means comprising a resilient member disposed in each pair of registered recesses and having a portion extending beyond the limits thereof and contacting the walls of said chamber.

5. In a device of the character described the combination of an annular chamber; a plurality of segmental weights in said chamber; and means for spacing said weights from each other and from the walls of said chamber, said means comprising a resilient member disposed at the adjoining ends of two adjacent weights, said member having a portion extending between such adjoining ends and having other portions extending beyond the limits of such two weights and in surface contact with walls of said chamber.

6. In a device of the character described the combination of an annular chamber; a plurality of segmental weights in said chamber; and means for spacing said weights from each other and from the walls of said chamber, said means comprising a plurality of resilient plug-like members, each member disposed at the adjoining ends of two adjacent weights and having a portion extending between such adjoining ends and having other portions extending beyond the limits of such two weights and in surface contact with walls of said chamber.

7. In a device of the character described the combination of an annular chamber; a plurality of segmental weights in said chamber; and means for spacing said weights from each other and from the walls of said chamber, said means comprising a plurality of resilient members, each member disposed at the adjoining corners of two adjacent weights, the outermost members having a resiliency different from the resiliency of the innermost members.

8. In a device of the character described the combination of an annular chamber; a plurality of segmental weights in said chamber; and means for spacing said weights from the outermost surface of said chamber, said means comprising a plurality of resilient members, each member disposed at the adjoining corners of two adjacent weights and extending beyond the limits thereof to contact the outermost surface of said chamber, the outermost members having a lesser resiliency than the innermost members.

9. In a device of the character described the combination of an annular chamber; a plurality of recessed segmental weights in said chamber; and resilient means engaging the registered recesses of and operating upon the corners of the weights for spacing said weights from each other and from the walls of said chamber, said means comprising members the outermost of which has a resiliency different from the resiliency of the innermost members.

10. In a device of the character described the combination of a rotatable chamber; a plurality of weights in said chamber, said weights collectively substantially filling the space of said chamber but movable in said chamber during rotation thereof, each weight having a recess extending inwardly from its outermost surface; and means for spacing said weights from the outermost surface of said chamber, said means comprising a resilient member engaging said recess and extending beyond the limits thereof to contact the outermost surface of said chamber.

11. In a device of the character described the combination of a rotatable chamber; a weight in said chamber, said weight substantially filling the space of said chamber but movable in said chamber during rotation thereof, said weight having recesses extending inwardly from its outermost and innermost surfaces; and means for spacing said weight from the outermost and innermost walls of said chamber, said means comprising a plurality of resilient members engaging said recesses and extending beyond the limits thereof to contact the outermost and innermost surfaces of said chamber.

12. In a device of the character described the combination of an annular chamber; a plurality of segmental weights in said chamber, each weight having a recess disposed in each end thereof, the recesses of each weight registrable with the recesses of the next adjacent weights; and means for spacing said weights from the outermost surface of said chamber, said means comprising a resilient member disposed in each pair of registered recesses and extending beyond the limits thereof to contact the outermost surface of said chamber.

13. In a device of the character described the combination of an annular chamber; a plurality of segmental weights in said chamber, each weight

having recesses extending inwardly from all faces thereof; and means for supporting said weights out of contact with each other as well as out of contact with any portion of said chamber, said means comprising spaced resilient members engaging said recesses and having portions extending therebeyond bearing against the walls of said chamber.

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