

July 1, 1952

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2,601,918

VIBRATOR SUPPORT WITH MULTISTAGE NOISE ATTENUATION

Filed June 29, 1949

Fig. 1

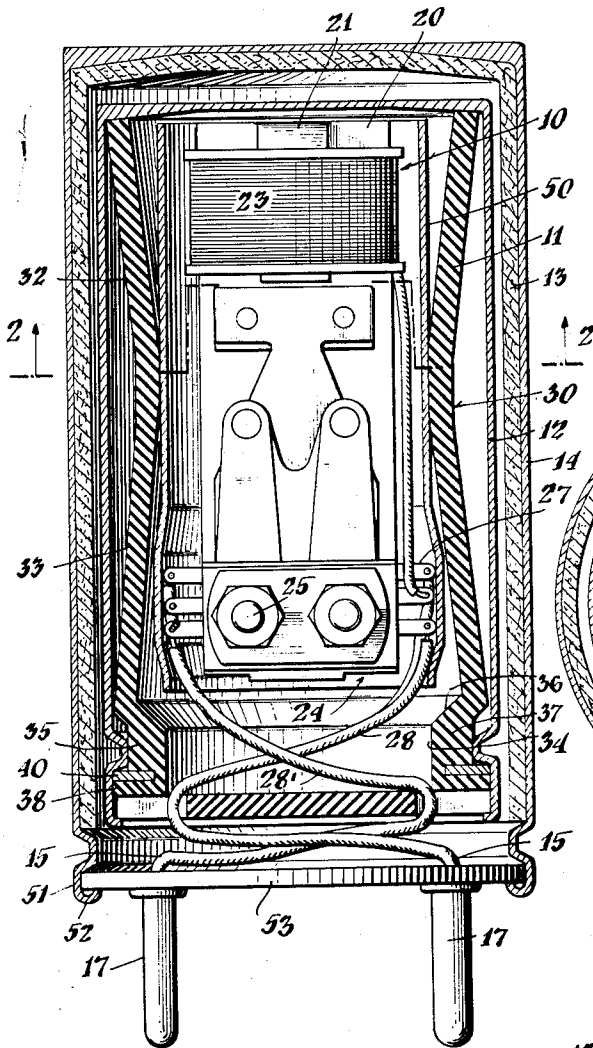


Fig. 2

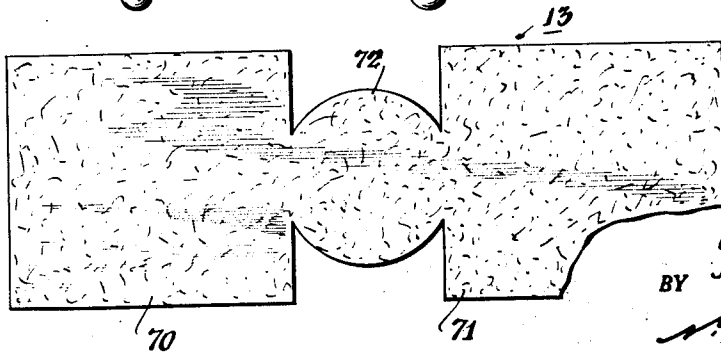
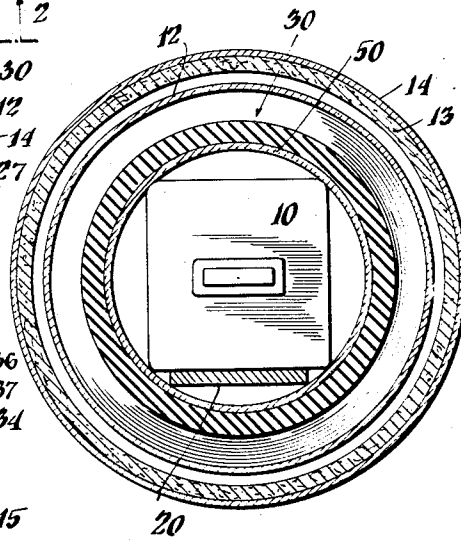


Fig. 3

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2,601,918

VIBRATOR SUPPORT WITH MULTISTAGE
NOISE ATTENUATION

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Application June 29, 1949, Serial No. 102,064

8 Claims. (Cl. 200-168)

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This invention relates to a support for vibratory motors and has specific application to such apparatus including means and methods for substantially eliminating vibrations transmitted from a vibrating unit through such a support.

In power supplies for radio sets, and for other purposes, wherein a storage battery or other low voltage current sources are utilized, it is common practice to provide a vibratory motor for periodically interrupting the current produced by a direct current source to alternately energize sections of a center-tapped primary winding. The alternating primary current thus established across a primary winding is then stepped up by the associated transformer and appears across a secondary thereof after which it may be rectified and used as a high voltage power supply for the various tubes and other electrical components and apparatus.

When utilizing such vibrators for the purposes stated as above, the vibrations of the moving parts of the vibrator, as for example, the reed and other vibrating parts, both of a mechanical and acoustical nature, are often times transmitted through the vibrator support to an associated apparatus such as a radio set establishing undesirable oscillations and noise characteristics therein. Further, this noise, being coupled to electronic discharge circuits may be amplified considerably and ultimately prove to be very undesirable and highly deleterious in the satisfactory operation of the associated equipment.

Thus any means which may prove effective in substantially lessening the opportunities for undesirable noise characteristics from being fed into electronic or electrical circuits of a radio system, etc., and which consequently interferes with the optimum operation of such a system, is a greatly desired achievement and makes for considerable advance in the arts of intelligence communication.

Means have been proposed for attenuating these undesirable vibration characteristics and noise, such as by providing a shielding element so as to reduce the mechanical and acoustical vibrations of the reed component of the vibrator. Moreover, a vibrator that is still considerably more quiet than the quietest normal vibrator now presently produced is indeed desirable, since, as automobiles and automobile radios become improved in quality, the need for quieter vibrators has become increasingly apparent.

By means of the present invention of a novel vibrator support for including said vibrator, attenuation means have been provided for substan-

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tially lessening all noise characteristics whether mechanical, acoustical, or vibratory.

The present novel vibrator support comprises a multi-stage noise attenuator construction wherein the vibrator is supported in a compliant medium and is completely enclosed by a rigid container acting as a single stage filter. This single stage filter is next supported within a second compliant medium and again is enclosed by a rigid container which thus effectively adds another stage of noise filtering to the first stage of filtering. This novel construction therefore acts as a two-stage low pass mechanical filter to transmitted vibrations through the vibrator support. At the same time, the double and complete enclosures substantially and drastically reduce air-borne noise emanating from the vibrator.

It is, therefore, a prime object of the present invention to provide a novel vibrator support having a multi-stage noise attenuation characteristic for substantially lessening and eliminating mechanical vibratory and acoustical noises from affecting the operation of communicators or radio apparatus.

Still another object of the present invention is to provide a vibrator in which both mechanical and acoustical vibrations are substantially lessened and eliminated thus providing noise free operation of communicators or radio apparatus.

Still another object of the present invention is to provide a noise-reducing device having the characteristics of a two-stage low pass mechanical filter.

Yet another object of the present invention is to provide a novel vibrator support wherein undesirable noise and oscillation characteristics may be substantially lessened by providing dual compliant vibrator mountings individually and separately circumscribed by rigid containers.

The invention, in another of its aspects, relates to novel features of the instrumentalities described herein for teaching the principal objects of the invention and to the novel principles employed in those instrumentalities whether or not these features and principles may be used in the said objects and/or in the said field.

Other objects of the invention and the nature thereof will become apparent from the following description considered in connection with the accompanying figures of the drawing wherein like reference characters describe elements of similar function and wherein the scope of the invention is determined from the appended claims.

Referring to the figures of the drawing:

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Figure 1 is a vertical sectionalized view of a preferred embodiment of the invention useful in illustrating the principles of construction and operation of the multi-stage attenuator vibrator support invention;

Figure 2 is a sectionalized view taken along line 2—2 of Figure 1 adapted to further illustrate the constructional features of the novel vibrator support of the invention; and

Figure 3 is an illustrative view of the novel one piece felt liner compliant structure used in the complete vibratory assembly.

Although a preferred embodiment of the invention is described herein, it is contemplated that considerable variation may be made in the method of procedure and the construction of parts without departing from the spirit of the invention. In the following description and in the claims, parts will be identified by specific names for convenience.

Generally speaking, the multi-stage attenuator vibrator support of the present invention comprises a vibrator element supported in a compliant medium 11 which is completely enclosed by a rigid container element 12 to form a single stage attenuator and/or low pass filter. This single stage filter or attenuator is enclosed, in turn, as by means of a second compliant medium 13 further enclosed by a second rigid container 14. By this novel construction and arrangement of parts, a two-stage low pass mechanical filter is cooperatively fabricated so as to substantially completely attenuate transmitted vibrations and noises passing through the vibrator support, while at the same time drastically reducing and lessening air-borne noise.

In Figure 1, the vibratory unit or motor generally designated as 10, may include an L-shaped frame 20 having, at one end thereof, a pole piece 21. Mounted on pole piece 21 is a coil 23 suitably adapted to be energized by a source of direct current. A stack 24 is secured to the other end of a frame, as by means of screw members 25. This stack consists of a plurality of insulating spacers between which are mounted the vibratory reed and contact structure of the vibrator. Such structure has been described in co-pending application Serial No. 2,106 for a Vibrator Support, filed on January 13, 1948, by Huetten et al., now Patent No. 2,513,940, dated July 4, 1950.

The vibrator is electrically connected to a plug 17 having terminals 27 as by means of conductors 28, 29. Vibratory assembly 10 is supported in a compliant manner as by means of support 30 which may be constructed as a frusto-conical compliant structure further having sections 32 and 33, which may be constructed of a sponge rubber material.

Vibrator unit 10 is slipped within a circumscribing tube structure 50, which may be constructed of cardboard. The circumscribing tube of cardboard 50 is connected to compliant support structure 30 as by molding. This is done by having the compliant structure 30 molded within a form containing cardboard tube 50, and while the rubber socket is being formed a limited circumferential inner region of the compliant structure is molded to or adhered to the outer surface of cardboard tube 50.

A base 34 integral with compliant structure 30 may be molded to form a seat structure 35 having an inclined section 36, a connecting section 37 and a leg section 38 having a steel ring 40 interposed between sections 34 and 38. Contiguous with and circumscribing said compliant

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structure 30 is a rigid container 12 which may be metallic in construction and which may be crimped so as to intimately conform to base 34 of compliant structure 30. Circumscribing said rigid container is a second compliant cup-shaped structure or sleeve 13.

Compliant sleeve member or liner 13 may be fabricated of felt and may be made in a unitary manner from a single piece of flat stock. It comprises two substantially rectangular end portions 70 and 71, interconnected by means of an integrally formed center section 72 having a substantially annular or disc-like configuration. Thus, in contradistinction to the usual complex arrangement of a disc and wrap around piece which is difficult to assemble, liner 13 is made in one piece and is expeditiously and simply assembled by merely inserting it within its circumscribing rigid container. Concentrically fitting over sleeve or lining 13 is a second rigid container 14 which may be suitably crimped in construction to afford optimum sealing as by means of sections 51 and 52 gripping and including an insulator 53. As shown in Figure 1 and as stated previously in the specification, the sealing of the second rigid container 14 is effectuated by an insulator 53 which is separated from base 34 of the first container so that a space exists therebetween. The double and complete enclosures thus include the space which exists between base 34 and insulator 53 of the second container whereby air-borne noise emanating from the vibrator is substantially and drastically reduced. In this manner a two stage low pass mechanical filter is constructed whereby means of alternate compliant and rigid assemblies, a two-stage noise attenuator and/or filter is provided whose simple and novel construction substantially eliminates and precludes vibratory noises from the vibrator section, per se, from affecting subsequent associated apparatus.

The novel vibrator support with multi-stage noise attenuation, as described above, is merely illustrative and not exhaustive in scope and since many widely different embodiments of the invention may be made without departing from the scope thereof, it is intended that all matter contained in the above description and shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. Multi-noise attenuating apparatus comprising in combination, vibrating means for converting a direct current voltage into a pulsating direct current voltage, compliant means adapted to support said vibrating means, said compliant means including an insulator tube, a compliant frusto-conical shaped sleeve connected therewith, a rigid container having a bottom circumscribing said compliant sleeve for attenuating noise from said vibrating means, a second filtering means including bottom insulator means separated from said first rigid container by a substantial air space existing between the bottom of said rigid container and the bottom of said filtering means, said filtering means being concentrically fitted over said compliant sleeve, plug means joined to said insulator means, and a plurality of conductors connecting said plug means to said vibrator, said conductors thus providing a floating support for said vibrator and whereby a substantially two-stage low pass noise filter is constructed substantially precluding noise of said vibrator from affecting apparatus coupled thereto.

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2. Apparatus as in claim 1, wherein said sleeve of said first-named compliant means is made of a sponge rubber material and said second filtering means includes a felt sleeve concentrically fitted over said rigid container.

3. A multi-stage noise attenuating vibrator support comprising in combination, vibrating means, a compliant medium including an insulator tube, a rubber sleeve connected thereto circumscribing said vibrating means, a rigid container having a bottom enclosing said compliant medium, a second compliant medium having a bottom separated from the bottom of said rigid container by a substantial air space, said second compliant medium adapted to surround said rigid container, container means enveloping said vibrator and said second compliant medium, a plug connected to said second container means, and a plurality of conductors interconnecting said plug and said vibrator to support the latter whereby vibration effects from said vibrator are substantially eliminated and prevented from passing to the outside.

4. A two-stage low pass mechanical filter for preventing vibration from being transmitted through a vibrator support comprising; a first filter including vibrating means for converting a direct current voltage to a pulsating direct current voltage, sponge rubber compliant means, an insulator tube surrounding said vibrator means, said sponge rubber means including one section adapted to support said tube surrounding said vibrating means and further having a frusto-conical shaped section integrally formed therewith, rigid container means enveloping said compliant means, said rigid container means being crimped; and a second filter comprising a second compliant sleeve completely enveloped by a crimped rigid container, said crimping of said rigid container being adapted to grip an insulating plug structure separated from said first rigid container means by a substantial air space, and a plurality of conductors interconnecting said insulating plug means and said vibrating means to support the latter thereby and to preclude noise from said vibrating means from affecting electrical circuit components connected to said plug means.

5. Apparatus as in claim 4, wherein said second compliant sleeve is fabricated of a single piece of flat stock, said piece including two substantially rectangular portions connected by an annular shaped center section.

6. A vibrator noise attenuating means for attenuating operating noises comprising in combination, a vibrator mechanism for converting a direct current voltage into a pulsating direct current voltage, means for compliantly mounting said vibrator, said means including an insulator tube and a rubber structure surrounded by a

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metal can having a bottom, second compliant means having a bottom enveloping said vibrator and being disconnected therefrom by a substantial air space existing between its bottom and the bottom of said metal can, said second means further including a felt sleeve enveloping said vibrating means, a metallic container enveloping said felt means externally thereto, a plug connected to said metallic container, and a plurality of conductors interconnecting said plug and said vibrator mechanism so that the latter is supported by said conductors in a substantially floating manner and whereby a substantially multi-stage low pass filter is obtained to prevent noise from said vibrator mechanism from affecting associated apparatus.

7. A noise preventing mechanism adapted for use with means for converting direct current voltage into pulsating direct current voltage, said means including a vibrating reed, a filter cooperatively associated with said vibrating mechanism, said filter including a compliant structure comprising a cardboard insulator tube, said tube having a rubber structure connected thereto with a rigid container circumscribing said latter structure, said rigid container having a bottom thereto, and sound filtering means also having a bottom circumscribing and enveloping said first filter, said sound filtering means being separated from said first filter means by a substantial air space existing between the bottoms of said sound filtering means and said rigid container, said second filtering means further including a second compliant structure and a metallic container enveloping said second compliant structure, a plug connected to said latter metallic container, and a plurality of conductors interconnecting said plug and said vibrating mechanism to support said vibrating mechanism.

8. An apparatus as in claim 7 wherein said metallic containers are crimped for optimum sealing from said vibrating means within said filtering means.

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