Feb. 7, 1928.

1,658,349

C. R. MOORE

LOUD SPEAKING RECEIVER

Filed March 26. 1926

Fig. 1

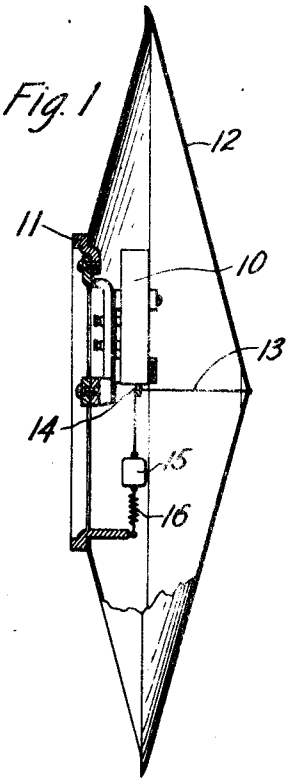


Fig. 2

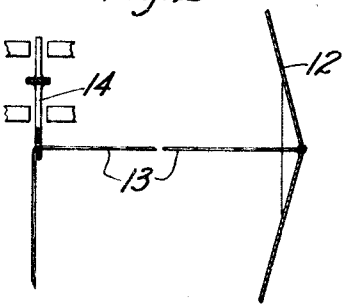


Fig. 3

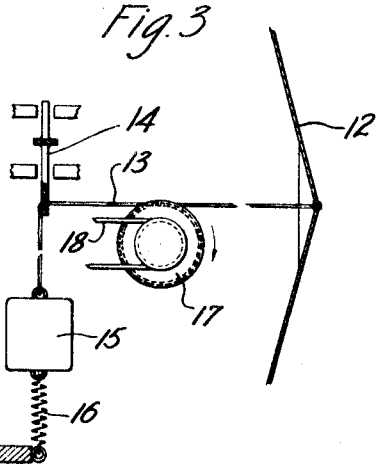


Fig. 4

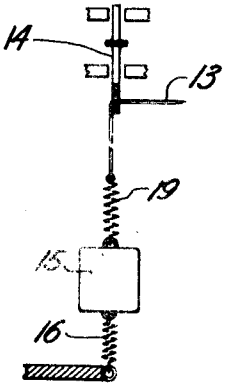


Fig. 5

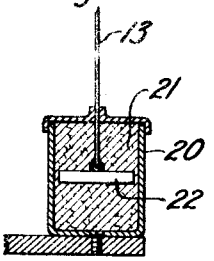
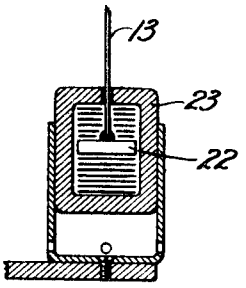


Fig. 6



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UNITED STATES PATENT OFFICE.

CHARLES R. MOORE, OF MAPLEWOOD, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

LOUD-SPEAKING RECEIVER.

Application filed March 26, 1926. Serial No. 97,640.

This invention relates to vibratory systems and more especially to such systems in which there is an intervening member between the vibrating part and the element causing the vibration.

In systems of the above nature it is at times necessary to compensate for the expansion and contraction of the various parts. In the case of metallic elements such changes are due primarily to changes in temperature, while in non-metallic parts, such changes may be due to variations in the amount of moisture, in the atmosphere, more commonly known as humidity, as well as changes in temperature.

An object of this invention is to compensate for the dimensional changes of a vibratory system so as to maintain the overall efficiency of the system substantially constant.

In certain vibratory systems, manual means has been provided to accomplish the above object. However, it has been found that frequently more trouble than benefit results when adjustment is made by persons not sufficiently versed in the accomplishment of this purpose. The means provided by this invention eliminates any manual changes, the dimensional changes of the parts being taken care of automatically.

The above object is attained through the use of a flexible, or semi-flexible, member which connects the driving element to the driven element, this member being maintained taut by a weight or similar device. The inertia of the weight members is such that they are not affected by the vibrations set up by the driving member, such vibrations being transmitted directly and with only slightly diminished intensity to the driven member.

The invention will be more thoroughly understood from the following description, in connection with the attached drawings giving specific embodiments thereof and in which:

Fig. 1 represents a hornless or cone type loud speaker element, which is quite common in radio work, to which the flexible member and weight have been applied, Fig. 2 represents, somewhat more in detail, the connection of the flexible member through the armature of the driving element, Fig. 3 shows the invention as applied to the mechanical type of amplifier, Fig. 4 represents a means for compensating for variations in the strength or flexibility of the intermediate member, and Figs. 5 and 6 represent alternative means which may be used in place of the weight alone.

Referring more particularly to Fig. 1 the driving member or motor element 10 is supported by frame 11 of the cone, substantially as shown. A string or other flexible member 13 is permanently fixed to the apex of the cone 12 and passes through a small hole or eyelet in the lower part of the armature 14 of the motor element. Suspended on this string, after it has passed through the eyelet, is a weight 15 which is attached to the frame by means of a spring 16.

The armature 14 of the motor element is moved between the pole pieces of a magnet in accordance with electric vibrations impressed on the windings of the motor element. The weight 15 is so chosen and the tension in the spring 16 is such that the natural period of the combination is far removed from the periods of vibration of the armature. For the small amplitudes and at the frequencies with which the armature will be vibrated, that portion of the string extending from the armature to the fixed point on the frame, and which includes the inertia members, acts substantially as a rigid lever pivoted at the fixed point. As used herein the term inertia members includes weight 15 and spring 16. With this arrangement the energy of the armature is transmitted through the string to the cone surface with only a very small loss to the inertia members.

It will be readily seen that since the apex of the cone is not fixed to a rigid member and since the inertia members will respond to slow movements, any dimensional changes in the cone surface due to atmospheric changes will be compensated for and the string maintained under tension. There will then be no buckling or warping of the surface and the position of the armature relative to the poles of the magnet will remain unchanged. Changes in the frame members, armature, etc., will also be taken care of in the same way.

In Fig. 3 the invention is shown as applied to a mechanical amplifier. This amplifier is well known in the art and consists of a drum 17 around which string 13 passes.

The drum is rotated at high speed from any suitable source by means of a belt 18 or similar arrangement. Any dimensional changes will be transmitted through string 13 to the inertia members with the drum 17 acting as a sliding surface or as a pulley.

In Fig. 4 an additional spring 19 is shown which compensates for any change in flexibility of the string 13.

Fig. 5 shows a substitute for the weight 15 and spring 16 and consists of a cylinder 20 containing a semi-fluid substance 21, such as heavy oil, wax, etc. A piston 22 is immersed in the semi-fluid substance and string 13 is attached to this piston either directly or through an intermediate stiff rod. It will be readily seen that any rapid motion of piston 22 will be opposed by the material in the cylinder but that any gradual movement thereof, which may be occasioned by the change in dimensions of the cone surface, will be permitted.

Another method which may be substituted for the weight and spring is shown in Fig. 6 and consists of the ordinary dash pot arrangement. The main piston 23 is hollow and encloses a number of sheets of paper, metal foil, etc., on either side of piston 22 which provides book damping for the piston, which is well known in the art. The result here is the same as for the piston in the semi-fluid of Fig. 5. Slow changes are permitted but to rapid vibrations the dash pot arrangement acts as a fixed member.

What is claimed is:

1. In a vibratory system, an electromagnetic element having a movable armature, a sound radiator to be vibrated, a non-rigid member frictionally connected to said movable armature, one end of which is attached to said sound radiator, and a tensioning means applied to the other end of said non-rigid member.

2. In combination, an electromagnetic responsive means, a sound radiator, a non-rigid member connected at one end to said sound radiator and bearing frictionally against said electromagnetic responsive means, and a member not responsive to high frequency vibrations, attached to the other end of said non-rigid member to maintain the same under tension.

3. In combination, an electro-magnetic device, an armature responsive to changes in the strength of the magnetic field of said device, a sound radiator, a flexible member frictionally connected to said armature, one end of said flexible member being attached to said sound radiator, and a member, not responsive to high frequency vibrations, attached to said flexible member to maintain the same under tension.

4. In a vibratory system, an electromagnetic element having a movable armature, a sound radiator to be vibrated, and a flexible member connected at one end to said diaphragm and at the other end to a tensioning means, said armature frictionally supporting said flexible member between its ends.

5. In a vibratory system, an electromagnetic element having a movable armature and a sound radiator, and means for compensating for changes other than those due to vibrations from said armature in the position of said radiator relative to said armature, said means comprising a flexible element bearing against said armature and connected at one end to said diaphragm and at the other end to a tensioning means.

In witness whereof, I hereunto subscribe my name this 22 day of March A. D., 1926.

CHARLES R. MOORE.