Aug. 20, 1957 J. URSCHLER ET AL 2,803,762

ELECTROMAGNETIC VIBRATORS

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Fig. 1.

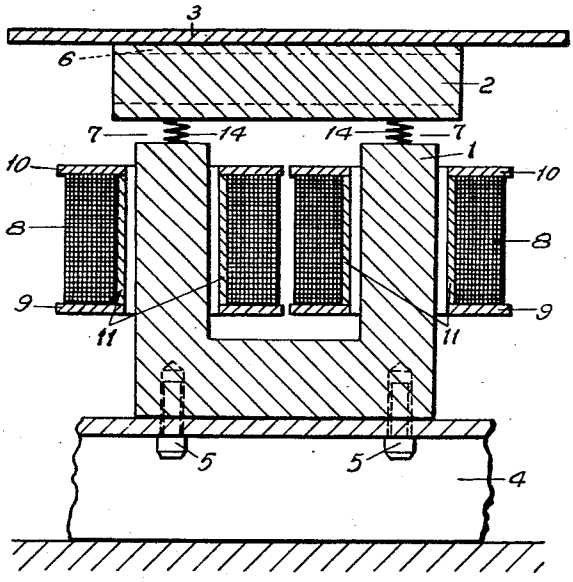
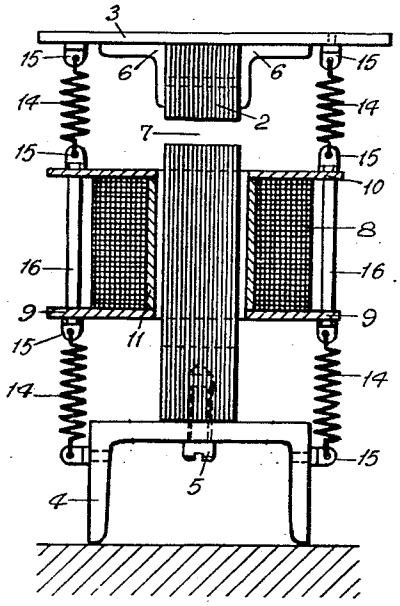


Fig. 2.



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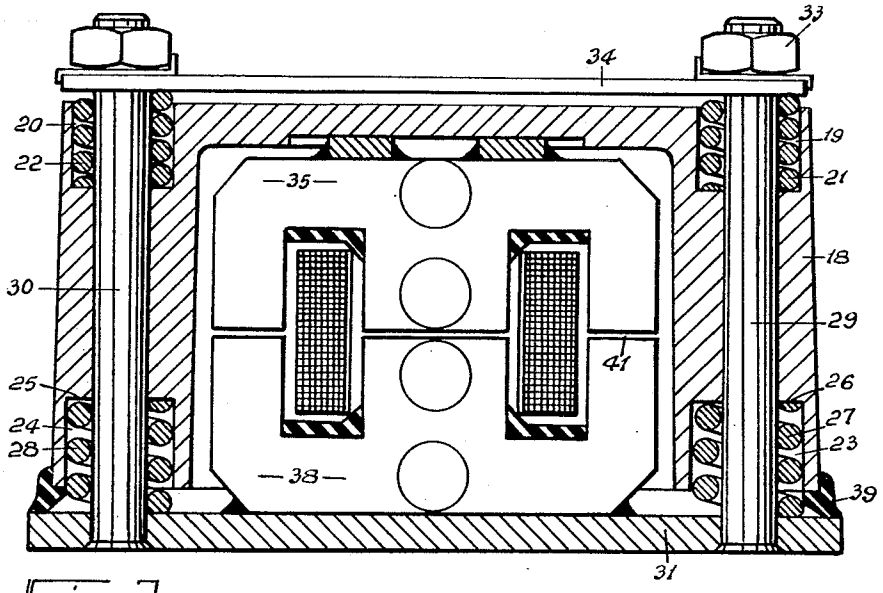


Fig. 3.

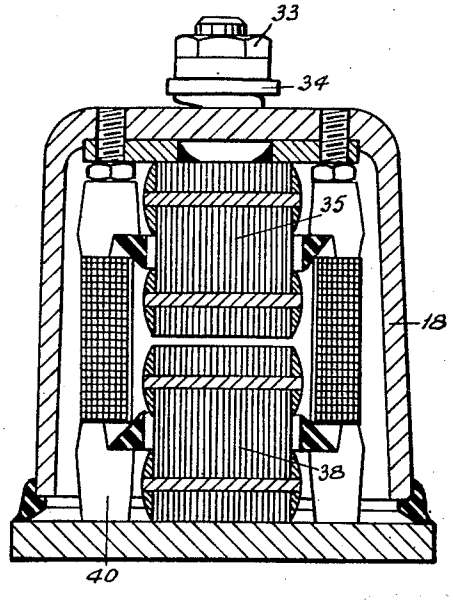


Fig. 4.

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ELECTROMAGNETIC VIBRATORS

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Application July 12, 1954, Serial No. 442,512
Claims priority, application France July 15, 1953
5 Claims. (Cl. 310—29)

This invention relates to vibrators of the kind comprising essentially a core of magnetisable material, an armature of magnetisable material resiliently mounted at a small separation from the core so as to be vibrated under the effect of varying magnetic fields induced in the core, and an induction coil arranged about the core for producing varying magnetic fields therein. Hitherto the coil has been either (*a*) directly mounted on the core whereby all the axial and radial vibrations of the core were transmitted to the coil, or (*b*) mounted thereon in such a manner as to be capable of resilient relative axial movement but not relative radial movement, whereby again some vibration at least is still undergone by the coil.

It is found in practice that continued vibration is very detrimental to the structure of such coils and it is accordingly the object of the present invention to provide an improved form of mounting for the coil, with respect to the core and armature, whereby the coil is resiliently suspended as regards both axial and radial movements of the vibrating members and is thus substantially unaffected by vibration.

In the accompanying drawing, illustrating by way of non-limiting example two embodiments of the invention:

Fig. 1 represents, in longitudinal section, a first embodiment of vibrator the coils of which are mounted in accordance with the invention.

Fig. 2 represents the same device seen in transverse section.

Figs. 3 and 4 show a second embodiment of vibrator seen respectively in longitudinal and transverse section.

In Figs. 1 and 2, the vibrating device is constituted by an armature **2** fixed on a vibrating plate **3** by brackets **6**, the vibrating plate being supported by any suitable known structure (not shown) in position above the core **1**. The armature is disposed above the laminated core **1** of soft iron in the form of a U. A gap **7** is formed between the core **1** and the armature **2**, and permits the vibrating plate **3**, and the mounting **4** on which the core **1** is fixed by screws **5**, to vibrate freely.

The resilient support between the vibrating plate **3** and the mounting **4** is arranged in such a manner that under the normal load the vibrating plate **3** will be in mechanical resonance with the desired frequency.

The inductance coils **8** are wound on an insulating spool member **11** having end plates **9** and **10**. The insulating spool **11** is disposed with play about the arms of the core **1** in such a manner as not to be in contact therewith at any point and is thus free to move both radially and axially within limits.

The end plates **9**, **10** are retained in position by rods **16**, and ring screws **15** are disposed thereon and also on the vibrating plate **3** and on the U-shaped mounting **4**. Springs **14** are engaged into the eyelets of these ring screws **15** and support the coils **8** in resilient manner.

The floating system is constituted by the coils **8** and the springs **14** are arranged and dimensioned in such a manner that its inherent resonant frequency is considerably lower than the frequency of vibration of the apparatus. Supports of rubber (not shown) could replace the springs **14**.

The vibrating device of Figs. 3 and 4 is constituted by an armature **18** provided with recesses **19**, **20** having shoulders receiving the relatively weak compression springs **21**, **22**. The lower part of the armature comprises recesses **23**, **24** with shoulders **25**, **26** receiving springs **27**, **28** of greater strength. Guides **29**, **30** are coupled by a cross-bar **34** secured thereon by nuts **33**, said cross bar bearing against the upper springs **21**, **22**. The movable core **35** is bolted on the armature **18** and the core **38** is soldered to the plate **31**. A flexible joint **39** completes the assembly. In Fig. 4, annular end pieces **40** of resilient material provide elastic support for the floating coil which can move radially and axially with respect to the core **38**.

By tightening the nuts **33**, and compressing the springs **20**, **21**, adjustment of the gap **41** can be effected. Under the effect of induction, the core **35** is attracted to the core **38**, and when induction lessens, the springs **27**, **28** force the cores apart again.

What we claim is:

1. A vibrating device comprising a core assembly including a mounting and a core of magnetisable material secured at one end thereon, an armature of magnetisable material disposed adjacent the other end of the core leaving a small gap between the armature and core, means resiliently supporting the armature adjacent the core whereby the armature may vibrate under the effect of varying magnetic fields induced in the core, an inductance coil disposed about the core and spaced therefrom, a first set of tension springs connected between the coil and the armature, and a second set of tension spring connected between the coil and the mounting, whereby the coil can move resiliently radially and axially with respect to the core and armature.

2. A vibrating device comprising a core mounting having two parallel spaced members, a core of magnetisable material secured on one said member, an armature disposed between the parallel spaced members and resiliently supported at a small distance away from the core by a first compression spring means arranged between the armature and the first spaced member and a second compression spring means arranged between the armature and the second spaced member, whereby the armature may vibrate under the effect of varying magnetic fields induced in the core, an inductance coil disposed about the core and spaced therefrom, and resilient mounting means arranged between the coil and the armature and between the coil and the second spaced member, whereby the coil can move resiliently radially and axially with respect to the core and armature.

3. A vibrating device, as claimed in claim 2, including means for varying the separation of the first and second spaced members for adjustment of the gap between the armature and core and for varying the natural frequency of the armature by varying the loading of the compression spring means.

4. A vibrating device comprising a core of magnetisable material, an armature of magnetisable material disposed adjacent the core leaving a small gap between the armature and core, means resiliently supporting the armature adjacent the core whereby the armature may vibrate under the effect of varying magnetic fields induced in the core, an inductance coil disposed about the core and spaced therefrom, and means resiliently coupling the coil respectively to the core and to the armature and acting both radially and axially of the coil to allow resilient radial and axial movement of the coil with respect to the core and armature.

5. A vibrating device, as claimed in claim 4, wherein the dimensions and weight of the coil and its resilient coupling means are so arranged that the natural frequency of the coil and coupling means is less than the operating frequency of the vibrating device.

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