Nov. 1, 1960 G. D. ALVORD 2,958,792

VIBRATORY MOTOR

Filed June 25, 1957

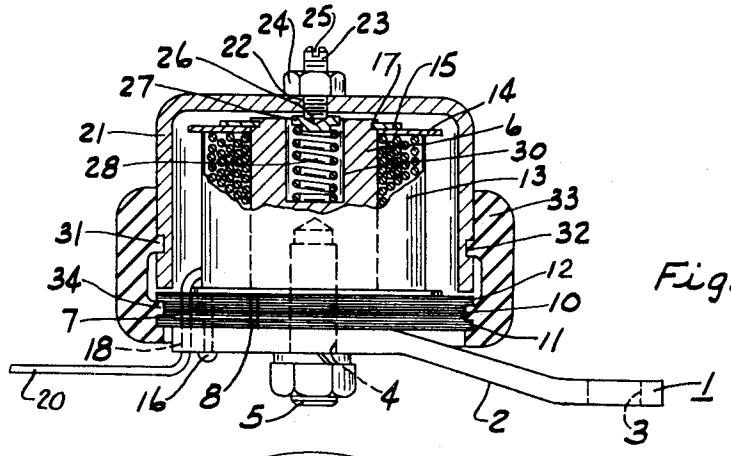


Fig. 1

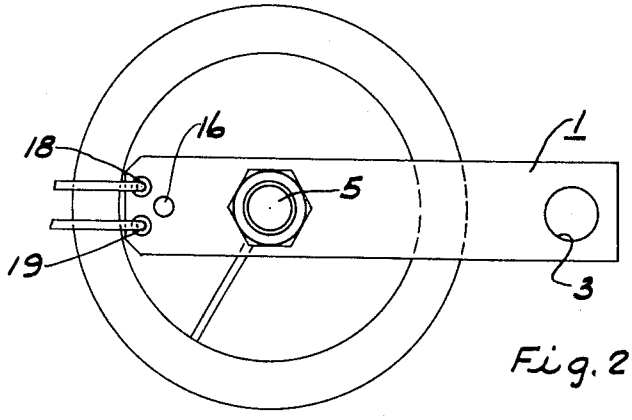


Fig. 2

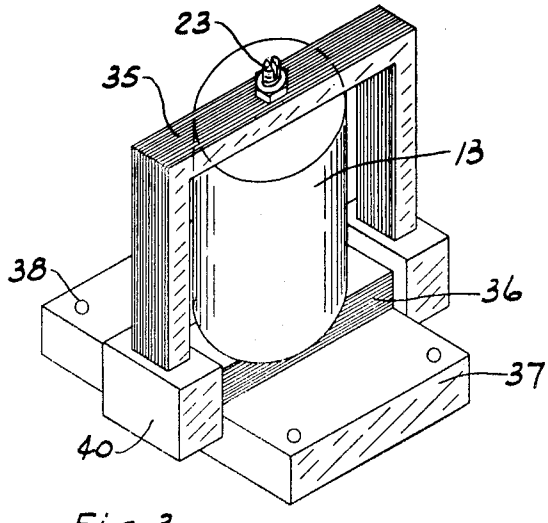


Fig. 3

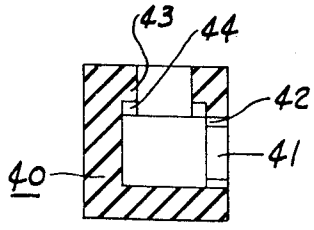


Fig. 4

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VIBRATORY MOTOR

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4 Claims. (Cl. 310—28)

This invention relates generally to vibratory motors and more particularly to a vibratory motor that is small, inexpensive and compact in design.

Small vibratory motors on the present market have a considerable number of parts making them expensive to manufacture. They are also difficult to tune so that the natural period of their mechanical system operates at the proper frequency which is usually a few cycles per second above or below the frequency of the driving impulses.

The principal object of the present invention is the provision of a simplified structure for a vibratory motor making the device readily assembled, thus decreasing its cost and at the same time providing a means for tuning the natural period of vibration of the vibratory motor.

Another object is the provision of a simplified vibratory motor that is enclosed and dust proof.

Another object is the provision of an offset mounting for a vibrator.

Another object is the provision of an elastomer for supporting the armature which is pre-loaded under tension to tune the natural period of vibration.

Other objects and advantages appear hereinafter in the following description and claims.

The accompanying drawings show for the purpose of exemplification without limiting the invention or claims thereto, certain practical embodiments illustrating the principles of this invention wherein:

Fig. 1 is a sectional view of the vibratory motor comprising this invention.

Fig. 2 is a plan view of the under side of the motor as shown in Fig. 1.

Fig. 3 is a perspective view of a modified form of the vibrator comprising this invention.

Fig. 4 is a detailed view of one of the elastomers employed in Fig. 3.

Referring to the drawings, the mounting bar **1** is in the form of a strap metal member bent intermediate its ends as indicated at **2** and provided with a hole **3** for mounting the same on the member to be vibrated. The mounting hole **3** is offset from the center of the vibrator which is marked on the mounting bar **1** by the hole **4** which receives the stud member **5** that is secured within the core member **6** of magnetizable material.

The stud member **5** is provided with a lock washer and nut and clamps the reactive base mounted core member **7** which is made up of a series of circular disc laminations that are slotted as indicated at **8** and are provided in different diameters so as to produce the annular groove **10**. The groove **10** is formed by having large discs forming the base **7** in the number of four laminations as indicated at **11** and eight laminations forming the groove indicated at **10** and five laminations forming the upper flange **12** defining the groove **10**. These laminations are tightly clamped by the stud **5** to be between the core **6**. The core **6** has mounted thereon the coil member **13** which is mounted on the usual spool **14** and is held in

assembled relation by means of the horseshoe clamp ring as indicated at **15** which fits in the cooperating groove **17** in the perimetral surface of the core **6**. Thus the coil is held firmly against the circular disc laminations forming the reaction base **7**.

A locking pin member **16** passes through the base strap **1** into the core reactor base **7**. The openings **18** and **19** pass through the reactor base **7** and the strap member **1** to carry the terminal leads from the coil **13**. These leads **20** may be connected directly to the alternating current frequency or they may be provided with alternate half wave electrical impulses by providing some form of half wave rectification between the alternating current supply and the coil. Such a circuit ordinarily includes a means for varying the voltage such as a rheostat to thereby change the amplitude of vibration of the vibrator.

The cap member **21** is made of magnetizable material and is in the form of a bell having a central opening **22** which is disposed axially of the core **6** and is threaded to receive the adjusting screw **23** which may be locked in place by the nut **24** and which is provided with a screw driver slot **25** for adjusting the same. The inner end of the adjusting screw **25** is provided with a pointed head **26** which is seated in the dished washer **27**, the washer being provided with a flange to receive the spring **28**. The spring **28** being positioned against the bottom of the chamber **30** axially of the core **6**. The helical spring **28** thus tends to force the bell cap or armature member **21** upwardly and this cap is provided with an annular groove member as indicated at **31** to receive an annular flange **32** on the interior of the rubber spring member **33** which is substantially cylindrical and is provided with two inturned annular flanges **32** and **34**. Now the flange **32** mates with the annular groove **31** in the bell armature and the flange **34** mates in the groove **10** formed in the reaction base **7**.

This rubber spring member **33** is made of resilient elastomer and is required to be snapped in place around the perimeter of the armature cap member **21** and the reaction base **7** to thus grip and tightly hold the same. The cooperating flanges keep the armature cap and the reactive base member from having any axial movement relative to the annular rubber spring member **33**. When the adjusting screw **23** is turned downwardly so as to compress the spring **28**, the latter causes the armature bell member to place the annular rubber spring **33** under tension and thereby tune the mechanical period of the vibrator. This structure thus completely encloses the coil and the elastomer spring member **33** is thus placed under tension by the spring **28** so as to tune the vibrator to operate at a proper frequency. The armature bell cap member **21** will thus vibrate up and down and create the proper vibratory action. The reaction base **7** and the mounting bar **1** will of course likewise vibrate as every reactive base is supposed to do. However, there will be some flexture in the mounting bar **1** in that it is disposed at a definite radius from the central axis of the vibrator to the mounting hole **3** which in combination produces the vibration that will tend to rock somewhat on the mounting bolt as well as provide the vibratory action. This is novel vibratory motion when applied to a bin as it tends to produce a different character of ripple and one should be assured of preventing the tearing of the metal around the bolt that goes through the mounting hole 3 of the mounting bar **1**.

The structure as shown in Fig. 3 the bell member armature has been replaced by the C-shaped laminated armature member **35** which is provided with the same mounting screw **23** and the coil **13** is also the same. However, the core **6** is secured to a cross member such as

indicated by the bar **36** which in effect is a secondary laminated armature forming part of the core of the coil and being secured to the core **6** in the same manner as that shown in Fig. 1. The base **37** is somewhat heavier than the base of the mounting bar shown in Fig. 1 and is provided with holes **38** for securing the same to the member to be vibrated.

The ends of the core reaction member **36** are inserted into rubber sleeves as indicated at **40**. Each sleeve has an opening **41** which snugly snaps over the end of the core bar **36** and is provided with an annular flange such as indicated at **42** that locks in an annular groove in the core to keep the rubber from accidentally being pulled off the end of the bar **36**. The ends of the armature **35** likewise has an annular flange which is held by the flange **43** and defines the opening **44** in the top of the rubber member **40** and thus pulls the armature relative to the straight core member **36**. By manipulating the adjusting screw **23** these elastomer members **40** may be stretched so as to properly tune the device and thus the elastomer is placed under tension for the purpose of tuning the same and functions in the same manner as that described in relation to Fig. 1.

I claim:

1. An electromagnetic vibrator having a reaction base with a core extending through a coil to provide opposite pole faces and a resiliently mounted armature characterized in that the reaction base includes the core which extends transversely beyond one end of the coil, and an elastomer means embracing the core extension and the armature resiliently mounting the latter in spaced relation with the core to provide operative air gaps therebetween, said transverse core section is a slotted annulus and the armature is bell-shaped with the elastomer being annular to completely close said annulus and bell.

2. The vibrator of claim 1 characterized in that said annular core and bell-shaped armature have indentations to receive projections on said annular elastomer.

3. An electromagnetic vibrator consisting of a reaction base including a mounting member and a magnetizable member, a core secured to said magnetizable member and extending upwardly therefrom, a coil on said core the transverse dimension of which is less than said magnetizable member, an armature member extending over the free end of the core and down within close proximity of said magnetizable member to produce symmetrical air gaps between said magnetizable member and said core, resilient means seated on said core, an adjustable member secured to said armature and engaging said resilient means, elastomer means embracing said magnetizable member and said armature under tension to exert a force counteracting the force of said resilient means and maintaining the air gap between said armature and said magnetizable member, said core adjacent said armature is hollowed to receive said resilient means, a washer engaging the other end of said resilient means, and said adjustable member extending through said armature to engage said washer and to be effective on said resilient means to change the tension on said elastomer means and vary the air gap, said armature means is bell-shaped and said magnetizable member is circular and said elastomer means is annular to engage both members.

4. An electromagnetic vibrator consisting of a reaction base including a mounting member and a magnetizable member, a core secured to said magnetizable member and extending upwardly therefrom, a coil on said core the transverse dimension of which is less than said magnetizable member, an armature member extending over the free end of the core and down within close proximity of said magnetizable member to produce symmetrical air gaps between said magnetizable member and said core, resilient means seated on said core, an adjustable member secured to said armature and engaging said resilient means, elastomer means embracing said magnetizable member and said armature under tension to exert a force counteracting the force of said resilient means and maintaining the air gap between said armature and said magnetizable member, said core adjacent said armature is hollowed to receive said resilient means, a washer engaging the other end of said resilient means, and said adjustable member extending through said armature to engage said washer and to be effective on said resilient means to change the tension on said elastomer means and vary the air gap, said magnetizable member is in the shape of a bar and said elastomer means is in two parts one capping each end of said bar in two parts, each part having angularly disposed openings with flanges for embracing and grasping said magnetizable member and armature.

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