June 9, 1953 D. A. STEWART 2,641,720

ELECTROMAGNETIC VIBRATOR

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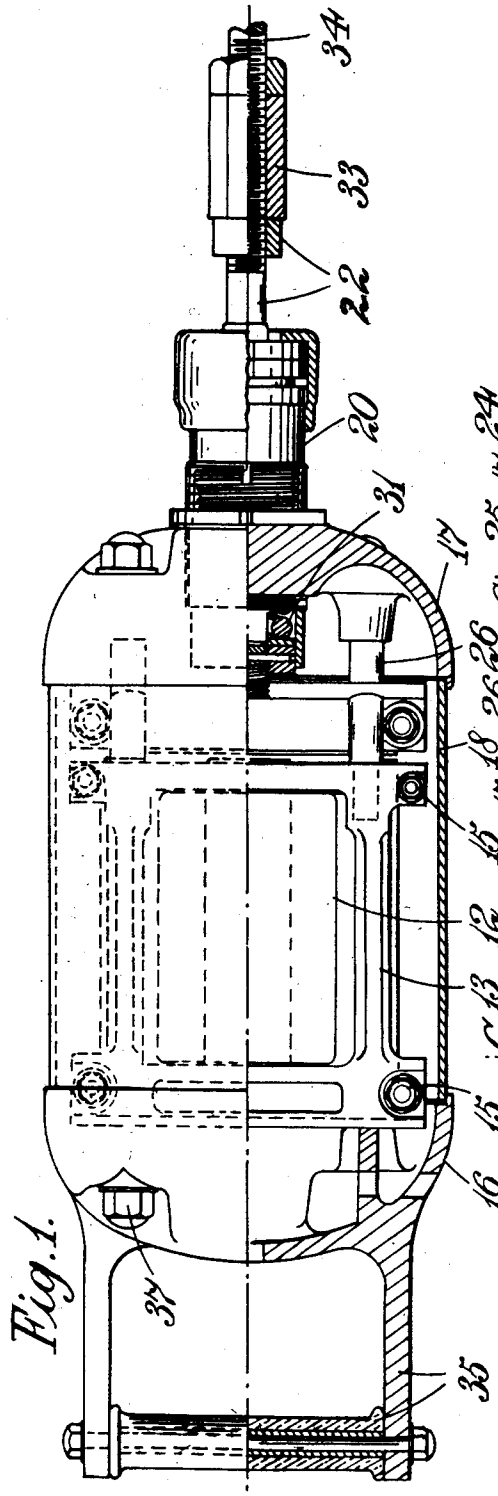


Fig. 1.

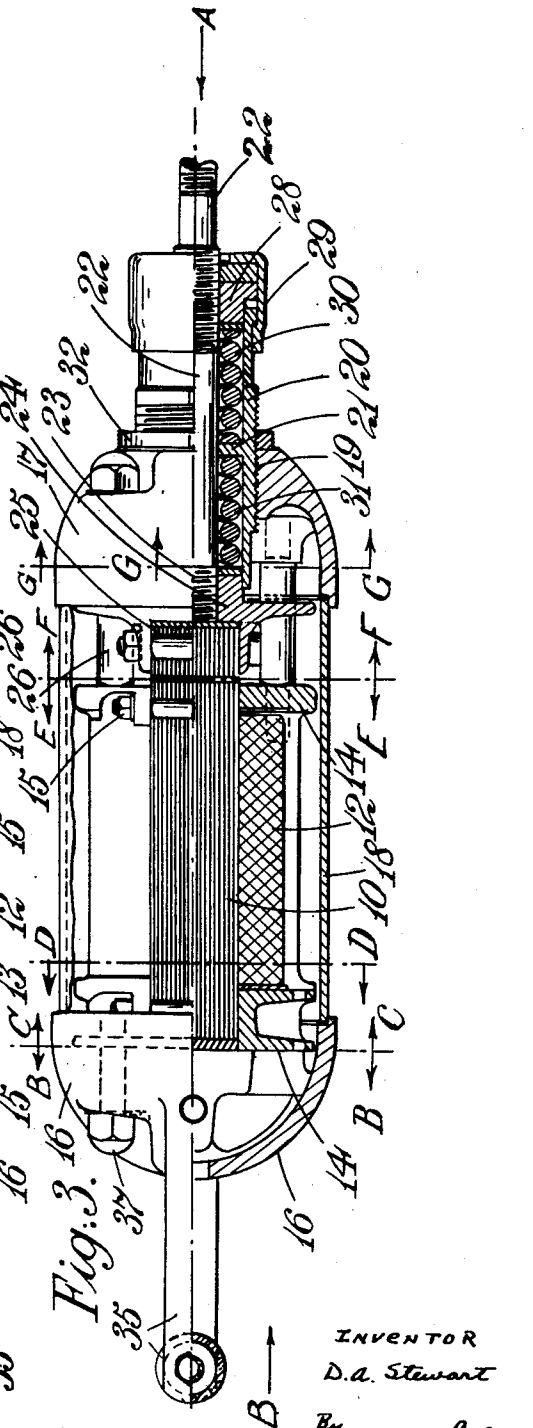


Fig. 3.

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Fig. 2.

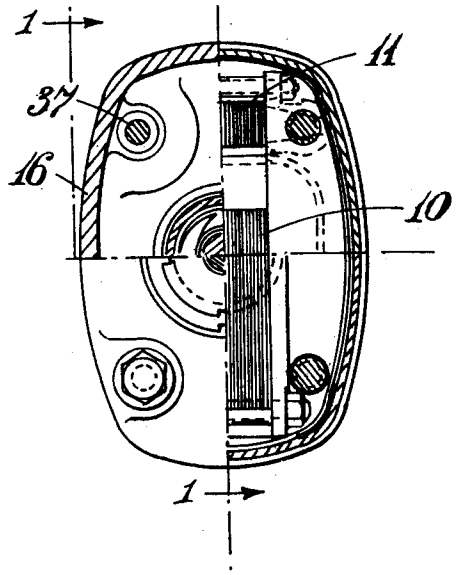
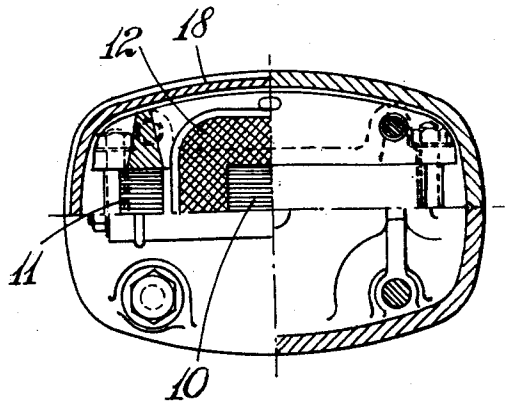


Fig. 4.



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ELECTROMAGNETIC VIBRATOR

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Application December 29, 1949, Serial No. 135,611
In Great Britain January 17, 1949

2 Claims. (Cl. 310—28)

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This invention relates to electro-magnetic vibrators and particularly to vibrators for vibrating concrete during setting, but is applicable for other purposes such as cutting stone, brickwork etc., agitating liquids for effective stirring and emulsification and for compacting powdered materials and carbon granules. Heretofore, it has been usual for one part of the electro-magnetic vibrator to be rigidly mounted in the framework carrying the article to be vibrated while the other part of the vibrator was connected directly to said article so that the framework took the greater part of the reaction.

According to the present invention a portable electro-magnetic vibrator is provided in which a part thereof to be supported by hand has sufficient mass for its inertia to provide the required reaction for the vibrating part, which vibrating part is attachable to or engageable with the article to be vibrated.

The invention is particularly applicable where the rate of vibration is of the order of 3,000 to 12,000 vibrations per minute.

It is found that the ratio of the masses of the main body of the vibrator to its armature should not be less than 2:1.

The electro-magnetic vibrator may be energised direct from the alternating mains.

In order that the minimum power input may be absorbed the vibrating part is so spring mounted on the other part as to resonate at twice the frequency of the supply.

The following is a more detailed description of a portable vibrator for vibrating setting concrete, reference being made to the accompanying drawing in which:

Figure 1 is a part elevation and part section on the line 1—1 of Figure 2,

Figure 2 is as to the top left of the figure a cross-section on the line C—C of Figure 3 and as to the top right a cross-section on the line E—E of Figure 3 and as to the bottom right a cross-section on the line F—F of Figure 3 and as to the bottom left an end elevation looking in the direction of the arrow B,

Figure 3 is a part elevation and part section in a plane at right angles to the section of Figure 1,

Figure 4 is as to the top left a cross-section on the line D—D of Figure 3 as to the top right a section on the line C—C of Figure 3, as to the bottom right a section on the line B—B of Figure 3 and as to bottom left an end elevation looking in the direction of arrow A in Figure 3.

The stator of the vibrator comprises a number of soft iron laminations which provide a central core 10 flanked on either side by portions 11

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of the laminations which provide a return flux path, and which are connected at their ends to said central core. The central core is surrounded by an energising coil 12 for connection direct to the mains. The laminations are clamped between two plates 13, 14 by means of suitable clamping bolts 15. The two plates have secured at opposite ends heads 16, 17 between which an encircling casing 18 is arranged, one of said heads 17 is provided with a threaded bore 19 which accommodates a threaded sleeve 20. The sleeve is formed with an internal flange 21 intermediate to its ends. A rod 22 passes through said sleeve and its inner end is screw-threaded at 23 to receive a clamping member 24 for a laminated armature 25. The clamping member is arranged to be slidably supported on bolts 26 which secure the head 17 to the aforesaid clamping plates 13, 14 of the stator. The other head 16 is secured by similar bolts 37 to the clamping plates and is provided with a handle 35. The screwed sleeve provides a means of adjusting the air gap between the armature laminations 25 and the cap 10. This adjustment may be used to vary the power delivered by the vibrator. The rod 22 outside the sleeve is screw-threaded to receive an abutment 28 which is encircled by a cap member 29 which extends over the outside of the sleeve. A heavy helical spring 30 encircles the rod 22 and is arranged between the abutment and said internal flange 21. A similar heavy spring 31 is arranged between the flange 21 and the aforesaid clamping member 24 for the armature. The threaded sleeve 20 is provided with a suitable lock nut 32. With this arrangement, the initial compression of the two springs 30, 31 may be adjusted mutually so as to be equal and so as to provide a natural periodicity of vibration equal to twice the frequency of the supply mains.

The outer end of the rod 22 is screw-threaded to receive a coupling 33 by means of which it may be attached to an extension 34. A flat disc (not shown) may be attached to the extension for application to the article to be vibrated or the extension may carry a tool holder.

Means may also be provided for stubbing or quickly arresting the relative movement of the part of the vibrator so as to apply a degree of shock to the material or body being vibrated. This stubbing may be effected by suitably adjusting the spring retaining cap 29 so that the abutment 28 meets the sleeve 20 carrying the spring, before the armature hits the core pole faces.

The weight of the parts 22, 25, 33 and 34 should

not be more than about half the weights of the remaining parts.

I claim:

1. A portable electro-magnetic vibrator for use with an alternating supply of known frequency comprising a laminated core arranged to provide two pole faces, an energizing coil associated with said core, which core is clamped between two plates, two heads arranged at opposite ends of and secured to said two plates, a hand-grip secured to one head, the other of which heads is provided with a threaded bore, an externally threaded tubular member engaging said threaded bore and having an internal flange intermediate of its ends, a bearing at one end of said tubular member, a rod extending through said bearing, abutments on said rod on opposite sides of said flange, an armature secured to said rod and spaced a short distance from said pole faces, helical springs encircling said rod on opposite sides of said flange, each of which engage said flange and one of said abutments, the mass of which armature energizing coil and heads on the one hand, and the mass of the rod and armature on the other hand and the stiffness of the springs are so selected in relation to the frequency of supply that resonance is set up when the energizing coil is energized.

2. A portable electro-magnetic vibrator for use with an alternating supply of known frequency comprising a laminated core arranged to provide two pole faces, an emergency coil associated with said core, which core is clamped between two plates, two heads arranged at opposite ends of and secured to said two plates, a hand-grip secured to one head, the other of

which heads is provided with a threaded bore, an externally threaded tubular member engaging said threaded bore and having an internal flange intermediate of its ends, a bearing at one end of said tubular member, a rod extending through said bearing, abutments axially adjustable along said rod on opposite sides of said flange, an armature secured to said rod and spaced a short distance from said pole faces, helical springs encircling said rod on opposite sides of said flange, each of which springs abut the flange and one of said abutments, the mass of which armature energizing coil and heads on the one hand and the mass of the rod and armature on the other hand and the stiffness of the springs are so selected in relation to the frequency of supply that resonance is set up when the energizing coil is energized.

DONALD ARNOTT STEWART.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
400,809	VanDepoele	Apr. 2, 1889
1,093,301	Vande	Apr. 14, 1914
1,111,038	Smith	Sept. 22, 1914
1,431,808	Jackson	Oct. 10, 1922
1,768,718	Soderberg	July 1, 1930
1,847,085	Flint	Mar. 1, 1932
1,904,955	Schouten	Apr. 13, 1933
1,928,812	Dawson	Oct. 3, 1933
2,122,888	McLeer	July 5, 1938
2,211,000	Brown et al.	Aug. 13, 1940
2,248,110	Murphy	July 8, 1941