Sept. 23, 1947. C. F. COAKE 2,427,990

VIBRATOR

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Fig. 1.

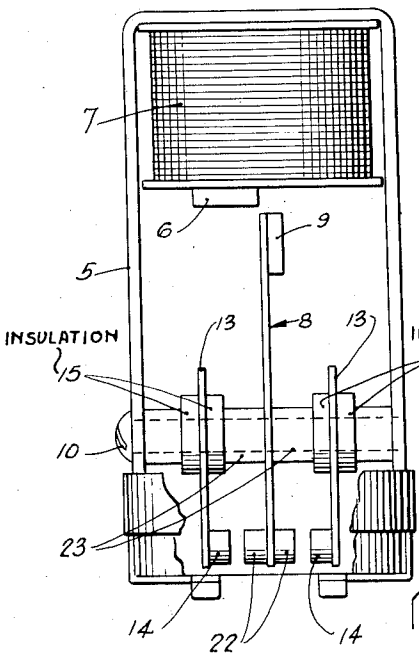


Fig. 3.

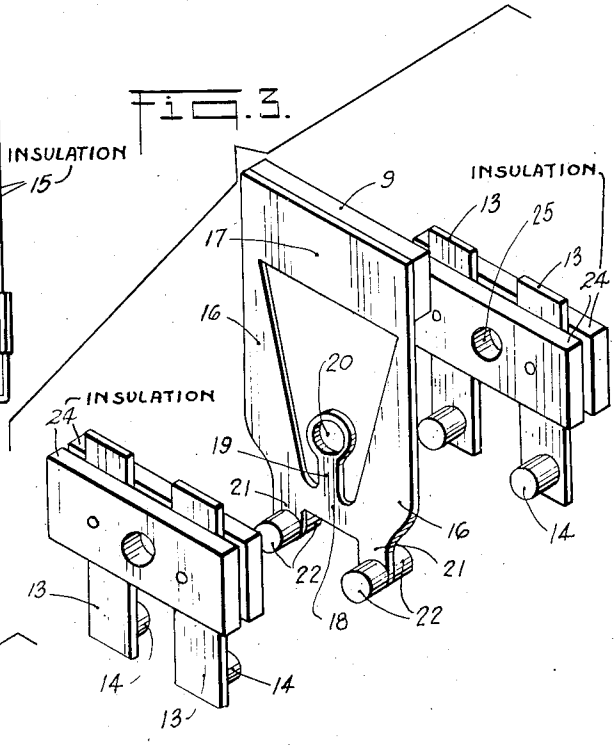
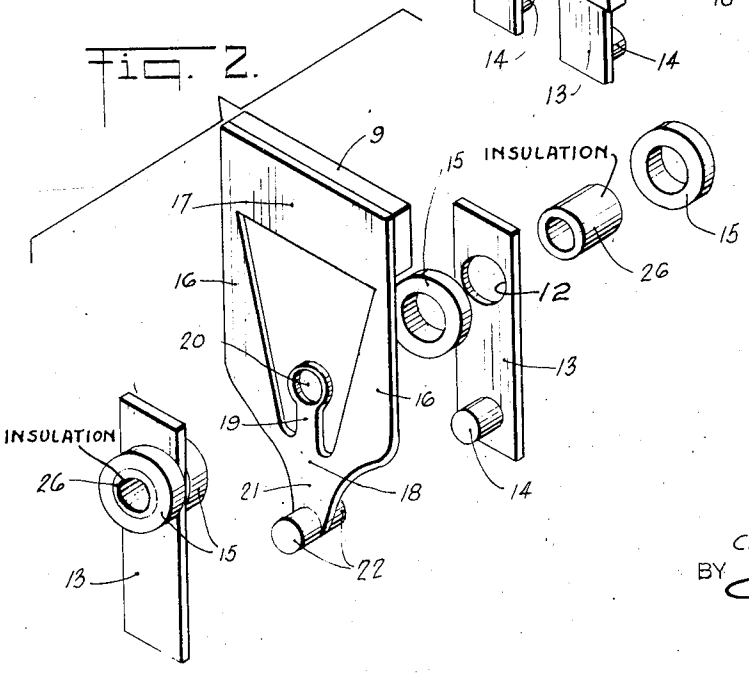


Fig. 2.



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VIBRATOR

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5 Claims. (Cl. 200—166)

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This invention relates to electromagnetic vibrators and particularly to vibratory reeds employed in such devices.

An object of the invention is to increase the stability and operating efficiency of a vibratory reed of the above type.

Another object is to provide a unitary vibratory reed and contact arm in which the ratio between the compliance of the contact arm and the compliance of the reed itself may be accurately controlled.

Another object is to provide a vibratory reed which is hinged to insure easy starting upon energization of the vibrator magnet, but in which the portions subject to flexing during the operation of the device possess the stiffness necessary to maximum vibrating efficiency.

A further object is to provide a vibratory reed of the type specified, having novel and improved details of construction and features of operation.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

Although the novel features which are characteristic of this invention are set forth more in detail in the claims appended hereto, the nature and scope of the invention may be better understood by referring to the following description, taken in connection with the accompanying drawing forming a part thereof, in which certain specific embodiments have been set forth for purposes of illustration.

In the drawing:

Fig. 1 is a broken plan view of an electromagnetic vibrator having a vibratory reed embodying the present invention;

Fig. 2 is an exploded isometric view of the vibratory reed and the cooperating stationary contact members; and

Fig. 3 is a similar view illustrating a modification of the invention.

In the following description certain specific terms are used for convenience in referring to the various details of the invention. These terms, however, are to be interpreted as broadly as the state of the art will permit.

In the drawing, Fig. 1 shows an electromagnetic vibrator comprising a U-shaped frame 5 of magnetic material supporting a pole piece 6 and a driver coil 7.

The vibratory reed 8 carrying armature member 9 is mounted on a pin or rivet 10 secured to the sides of frame 5. The pin 10 extends through holes 12 in stationary contact arms 13 carrying

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contacts 14, and clamps said contact arms 13 between insulating spacers 15 and metal spacers 23 on opposite sides of the vibratory reed 8. Insulating sleeves 26 extend through the holes 12 in the arms 13 and through the spacers 15 to insulate the arms 13 from the frame.

The vibratory reed 8, shown in detail in Fig. 2, comprises a flat member which is preferably stamped out of resilient sheet metal and has the following parts all preferably lying in a common plane; a pair of spaced side arms 16 having their ends connected by top and bottom yokes or cross arms 17 and 18, respectively; an inner arm or tongue 19 projecting upwardly from the center of the bottom yoke 18 into the space between the side arms 16 and having a hole or eyelet 20 in its upper end for securing same to the pin 10 of the vibrator; and a contact arm 21 projecting downwardly from the center of the bottom yoke 18 and having contacts 22 on opposite faces thereof for engagement with the stationary contacts 14 of the electromagnetic vibrator. In the embodiment illustrated, the side arms 16 of the reed are tapered from a maximum width at the bottom yoke 18 to a minimum width at the top yoke 17, the purpose of this construction being hereinafter more fully described.

The reed 8 is suspended in the vibrator by passing the pin 10 through the eyelet 20 in the tongue 19 of the reed and clamping said tongue between the spacers 23 on the pin, as shown in Fig. 1. The top yoke 17 of the reed carries the armature member 9, as shown in Figs. 1 and 2.

The reed will start vibrating easily because the tongue 19 acts as a narrow hinge which bends readily to allow the reed to start vibrating before the side arms flex. When the reed is set into vibration the side arms flex and control the vibrator's efficiency. These arms may be comparatively stiff as required to obtain a short natural period and are shown as tapered in accordance with the stress distribution along said arms in order to insure uniform flexing.

The compliance of a vibratory reed is the reciprocal of stiffness and determines the ability of the reed to flex or bend. The compliance of the present reed is the sum of the compliances of the side arms 16, the tongue 19, and the bottom yoke 18, but it will be noted that the side arms 16 and tongue 19 flex or bend while the yoke 18 twists as a result of the torque applied thereto. The compliance of the contact arm 21 is determined by the compliance of the elements between the contacts 22 and the anchor point or eyelet 20. Initially the reed deflects as a whole about the

tongue 19 as a hinge until the contacts 22 engage their mating contacts 14 which act as abutments to prevent further movement of the contacts. Thereafter further movement of the armature causes flexing of the side arms 16 and to some extent a twist of the yoke 18.

The width of the contact arm portion as well as the thickness of the material determines the contact pressure. This should be selected to give the optimum conditions of contact resistance and contact erosion.

The side arms 16 of the reed and the contact arms 21 are all necessarily of the same thickness because they are stamped out of the same blank of resilient sheet metal. Hence the ratio of compliances will remain the same for all reeds blanked from the same die regardless of slight variations in the thickness of the stock.

Fig. 3 shows a modification of the invention in which two contact arms 21, each having contacts 22 on opposite faces thereof, project downwardly from the bottom yoke 18 beneath the side arms 16 of the reed. This embodiment requires pairs of stationary contact arms 13 carrying contacts 14 for engagement with the dual contacts 22 of the reed, and such pairs of contact arms 13 may be secured between insulating bars 24 containing holes 25 for mounting on the shaft 10 of the vibrator, with a spacer (not shown) between the bars 24 to prevent bending or breaking due to clamping presure. Otherwise the construction and operation of this reed are the same as described above in connection with Fig. 2.

Although certain specific embodiments have been shown and described herein for purposes of illustration, it will be evident to those skilled in the art that the invention is capable of various modifications and adaptations within the scope of the appended claims.

What is claimed is:

1. A vibratory reed for an electromagnetic vibrator, comprising a pair of spaced resilient side arms, top and bottom yokes connecting the respective ends of said arms, a tongue projecting upwardly from said bottom yoke into the space between said side arms, a contact arm projecting downwardly from said bottom yoke, means for securing said tongue to a support, and contacts carried by said contact arm.

2. A vibratory reed for an electromagnetic vibrator, comprising a flat metal member having a pair of spaced side arms, top and bottom yokes connecting the respective ends of said side arms, a tongue projecting upwardly from said bottom yoke into the space between said side arms, a contact arm projecting downwardly from said bottom yoke, means on said tongue for securing same to a support, and contacts on opposite faces of said contact arm.

3. A vibratory reed for an electromagnetic vibrator, comprising a flat metal member having a pair of spaced side arms, top and bottom yokes connecting the respective ends of said side arms, a tongue projecting upwardly from said bottom yoke into the space between said side arms, a contact arm projecting downwardly from said bottom yoke, means on said tongue for securing same to a support, and contacts on opposite faces of said contact arm, said side arms being tapered to distribute the bending stress uniformly therealong.

4. A vibratory reed for an electromagnetic vibrator, comprising a flat metal member having a pair of spaced side arms, top and bottom yokes connecting the respective ends of said side arms, a tongue projecting upwardly from said bottom yoke into the space between said side arms, a contact arm projecting downwardly from said bottom yoke, means on said tongue for securing same to a support, and contacts on opposite faces of said contact arm, said side arms being tapered from a maximum width at said bottom yoke to a minimum width at said top yoke to distribute the bending stress uniformly therealong.

5. A vibratory reed for an electromagnetic vibrator, comprising a flat member stamped out of sheet metal and having a pair of spaced side arms, top and bottom yokes connecting the respective ends of said side arms, a tongue projecting upwardly from said bottom yoke into the space between said side arms, a contact arm projecting downwardly from said bottom yoke, an armature member carried by said top yoke, means on said tongue for securing same to a support, and contacts on opposite faces of said contact arm, said side arms being tapered from a maximum width at said bottom yoke to a minimum width at said top yoke to distribute the bending stress uniformly therealong.

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