Feb. 21, 1939. H. M. DRESSEL 2,148,193

VIBRATOR

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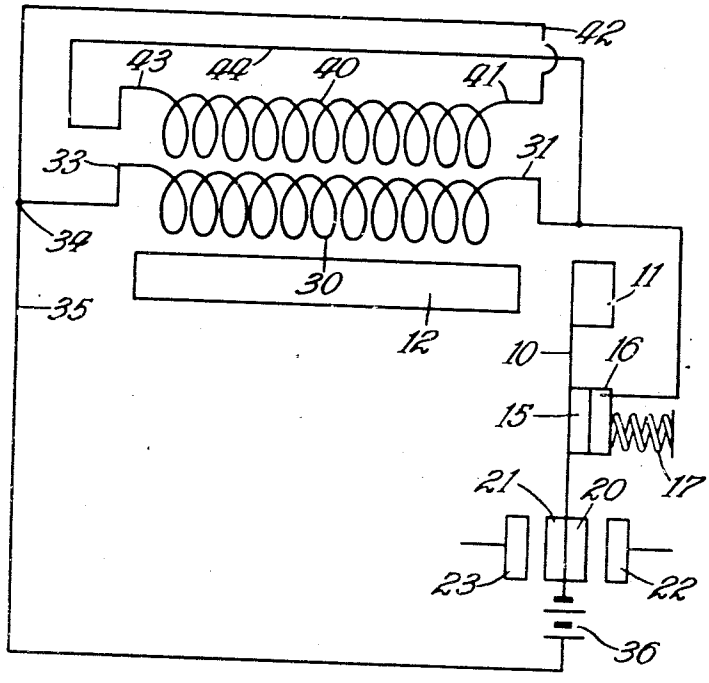

Fig. 1

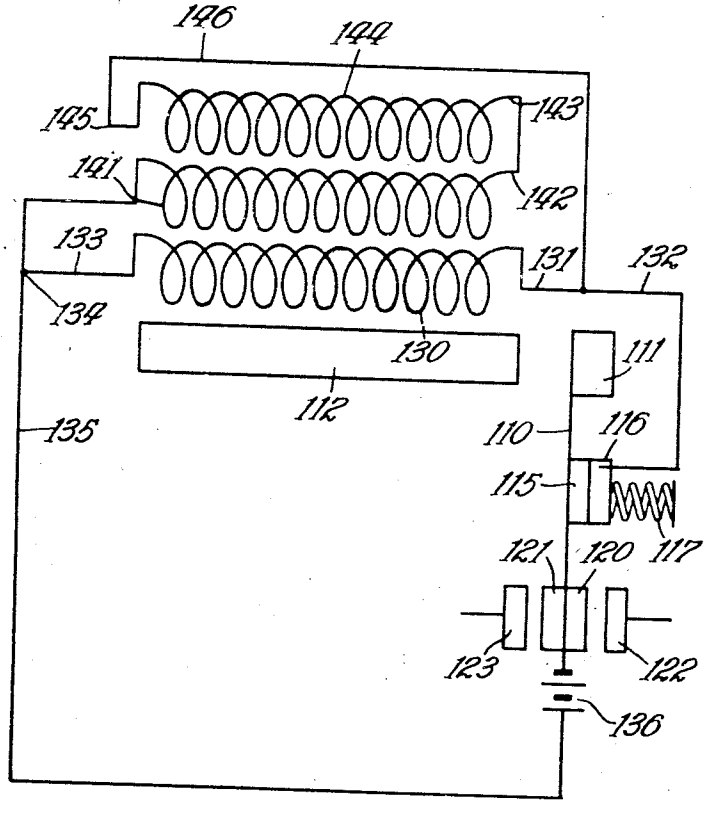

Fig. 2

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VIBRATOR

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7 Claims. (Cl. 172—126)

This invention relates to vibrators and particularly to a means for insuring substantially arcless operation of vibrators. In my prior Patent 2,012,123, granted August 20, 1935, I have disclosed the use of a short-circuited winding, preferably wound in bifilar relationship to the vibrator winding for the purpose of reducing arcing at the driving contacts. As pointed out in that patent, it is desirable to separate the driving contacts from the power contacts for the reason that the driving contacts which handle but little power may be made of high grade material. The power contacts which control the transformer circuit are customarily larger and heavier and may be of cheaper material.

The invention herein disclosed has the same general object as the above patent and accomplishes the same by different means.

Referring to the drawing:

Figure 1 shows a circuit diagram of one form of the invention, while Figure 2 shows a circuit diagram of the modification thereof.

Referring to Figure 1, the vibrator, which may be of any desired construction and preferably like that shown in the co-pending application of Dressel et al., Serial No. 758,925, filed December 9, 1935. The vibrator comprises a reed 10 rigidly fastened at one end and having an armature 11 at the free end and adapted to cause the reed to vibrate in response to the fluctuating magnetic field created in pole piece 12. Reed 10 carries a vibrator driving contact 15 which is adapted to cooperate with a fixed driving contact 16 preferably mounted on a spring 17 so that a yielding of the contact will occur.

Reed 10 also carries a pair of vibrator power contacts 20 and 21 cooperating with fixed power contacts 22 and 23 respectively. These fixed contacts may be connected to a transformer primary in the usual fashion.

In order to excite pole piece 12, a magnetizing coil 30 is provided having one terminal 31 connected by a lead 32 to fixed driving contact 16. The other terminal 33 of coil 30 is connected through a junction point 34 to a line 35 which runs to one terminal of a battery 36 whose other terminal is connected to reed 10.

As is well understood, reed 10 is vibrated back and forth and as shown in Figure 1 is adapted to swing far enough to the right so that fixed contacts 20 and 22 engage. Fixed driving contact 16 is adapted to engage movable contact 15 in the normal rest position of the reed to enable the device to be self starting.

In order to reduce arcing across driving contacts 15 and 16 of the vibrator, I preferably provide a second winding 40 having one terminal 41 connected by line 42 back to junction point 34 while the other terminal 43 is connected by line 44 back to line 32. It is thus evident that the magnetic effect of second winding 40 opposes that of winding 30. Winding 40 is preferably wound in bifilar relationship to winding 30 and has a comparatively high resistance to that of winding 30. Thus, in actual practice, a vibrator for use in connection with automobile radios on six volts generally has a magnetizing coil having a resistance of about 12 ohms. In accordance with this invention, the second winding will preferably have a resistance of at least about 48 ohms. This resistance could be obtained by either using copper wire of a suitable gauge or by using a metal having more resistance than copper and adjusting the gauge accordingly. The resistance in this case may be anywheres from 4 to 25 times as much as the magnetizing coil. It is understood of course that the magnetizing effect of coil 40 on the reed is substantially less than that of coil 30.

As is clearly evident from the circuit diagram, the second coil 40 is connected directly across the terminals of the magnetizing coil. When the driving contacts open, the current in the coils of the magnetizing winding has a gradual resistance decay characteristic.

It is obvious that if the second winding is closely coupled to the first winding, but a small current should pass through when the driving contacts are closed. On the other hand, too high a resistance will prevent the magnetizing winding from discharging readily and thus defeat the object of the invention, namely the elimination of sparking at the driving contacts. I have determined that the above proportions are most desirable. It is understood, of course, that under special cases, the proportion may be varied.

Referring to Figure 2, the reed 110 is provided with armature 111 cooperating with a magnetizing pole 112. The cooperating driving contacts 115 and 116 are similar to that shown in Figure 1. Driving contact 116 is spring supported at 117. Power contacts 120 and 121 are carried by the reed and cooperate with fixed power contacts 122 and 123. The magnetizing winding 130 has its terminal 131 connected by a line 132 back to driving contact 116, while the other terminal 133 is connected through a junction point 134 to line 135 and thence through the battery 136 back to reed 110.

Connected to junction 134 is one terminal 140

of a second winding 141 whose other terminal 142 is connected to terminal 143 of a third winding 144 whose remaining terminal 145 is connected by line 146 back to line 132. Windings 141 and 144 are preferably though not necessarily of higher resistance than magnetizing winding 130. These two windings are preferably wound in bifilar relationship and, as clearly indicated, have equal and opposite magnetizing effects. Both of these two additional windings may be wound in bifilar relationship to the main magnetizing winding 130, although this is not essential. Since the two additional windings neutralize each other, it is clear that no demagnetizing action of the energizing current need be feared. However, in order not to waste power, it is desirable to have these two additional windings 141 and 144 of substantially higher resistance than winding 130, such as, for example, between 4 and 25 times, as disclosed above in connection with Figure 1.

What is claimed is:

1. In a vibrator having a reed provided with a free vibrator end and a magnetizable pole piece, a contact carried by said reed and movable therewith, a stationary contact cooperating with said movable contact, a magnetizing coil for said pole piece connected to said two contacts for effecting reed vibration on circuit energization and an auxiliary winding disposed in electromagnetic relationship to said magnetizing winding and connected directly in shunt with said magnetizing winding but in reversed relation, said auxiliary winding having a substantially smaller magnetic effect on the reed than said magnetizing winding.

2. The structure of claim 1 wherein said auxiliary winding is wound in bifilar relationship with the magnetizing winding.

3. The vibrator of claim 1 wherein said reed carries additional power contacts and wherein additional stationary contacts are provided to cooperate with said reed power contacts.

4. In a vibrator having a reed with a free vibratable end cooperating with a magnetizable pole piece, a contact carried by said reed, a stationary contact cooperating with said reed contact, a magnetizing coil for said pole piece, connections between said magnetizing coil and said contacts for effecting reed vibration upon circuit energization, and a pair of auxiliary windings in series with each other but in shunt to said magnetizing winding for suppressing arcing at the contacts, said auxiliary windings having equal and opposite magnetic effects on said pole piece.

5. The vibrator of claim 4 wherein said auxiliary windings are wound in bifilar relation to each other.

6. The vibrator of claim 4 wherein said auxiliary windings and magnetizing winding are all wound in bifilar relationship to provide maximum coupling.

7. In a vibrator having a reed provided with a free vibrator end and a magnetizable pole piece, a contact carried by said reed and movable therewith, a stationary contact cooperating with said movable contact, a magnetizing coil for said pole piece connected to said two contacts for effecting reed vibration upon circuit energization and an auxiliary winding in electromagnetic relationship to said magnetizing winding and shunted across said magnetizing winding, said auxiliary winding having at least one portion thereof in reversed relationship to said magnetizing winding, with the magnetic effect of said reversed portion on said reed being less than the magnetic effect of said magnetizing winding on said reed.

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