Aug. 19, 1941. H. M. DRESSEL 2,252,882

VIBRATOR

Filed Dec. 24, 1934 2 Sheets-Sheet 1

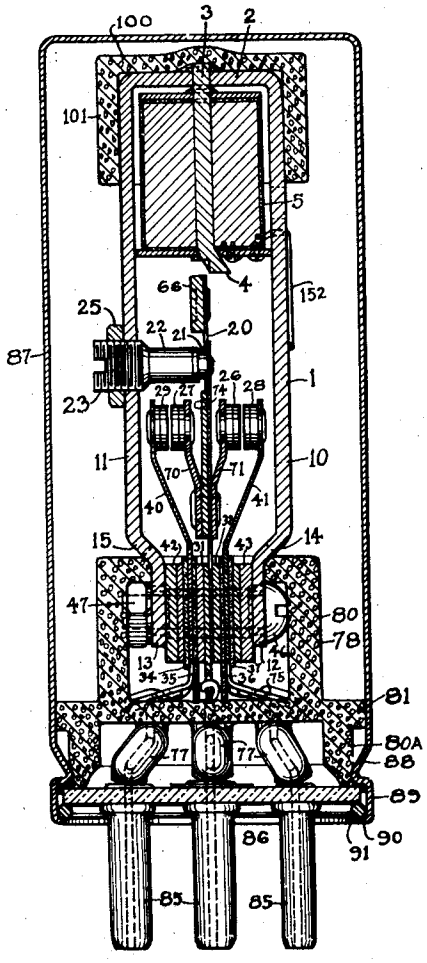

FIG. 1.

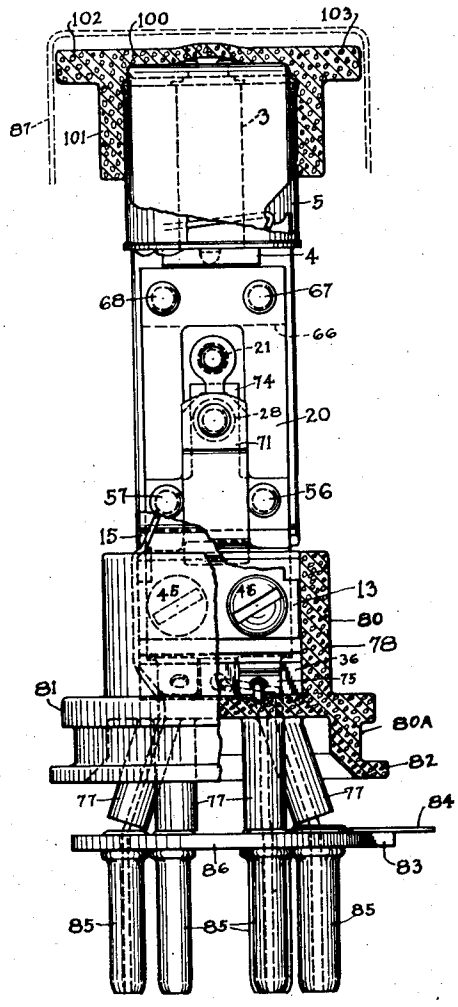

FIG. 2.

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VIBRATOR

Filed Dec. 24, 1934 2 Sheets-Sheet 2

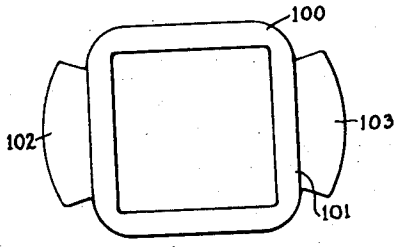

FIG. 3.

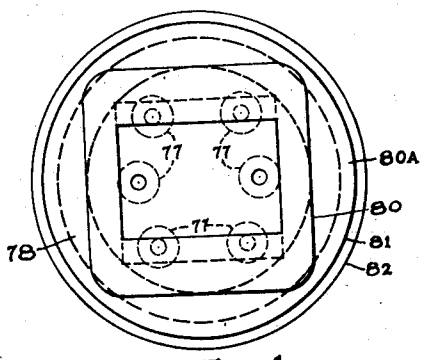

FIG. 4.

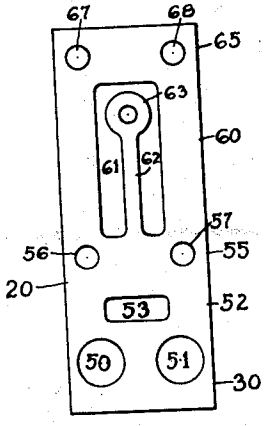

FIG. 5.

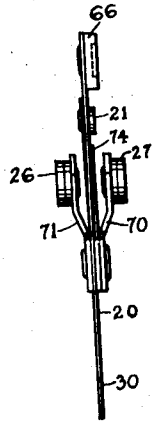

FIG. 6.

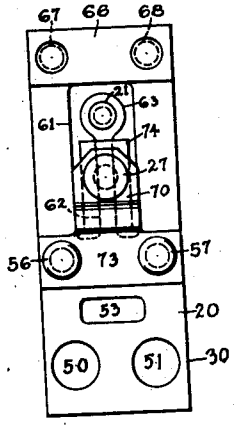

FIG. 7.

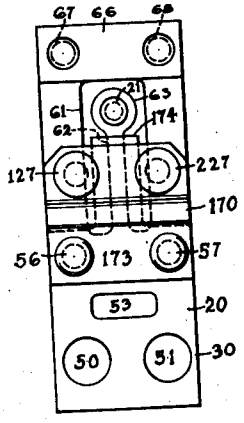

FIG. 8.

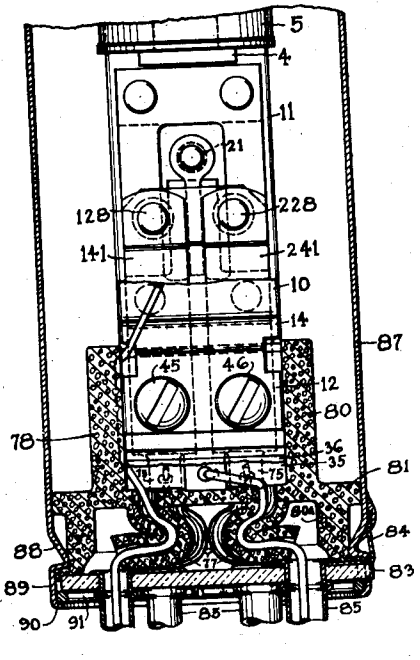

FIG. 9.

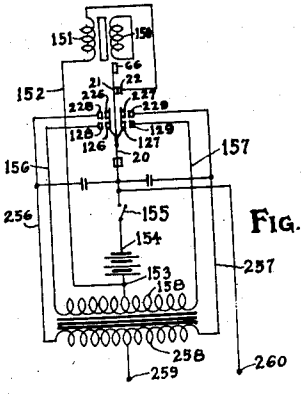

FIG. 10.

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UNITED STATES PATENT OFFICE

2,252,882

VIBRATOR

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Application December 24, 1934, Serial No. 758,924

32 Claims. (Cl. 200—90)

This invention relates to vibrators and more particularly to vibrators for use in connection with automobile radios and the like. Vibrators for this purpose are customarily energized from a 6 or 12 volt battery, and are adapted to supply an interrupted current to a transformer. Because of the low voltage and the high current density, great difficulty has been experienced in providing a satisfactory vibrator which will function at a uniform level of efficiency. In the past, trouble has been experienced at the contacts, which has resulted in a high voltage drop, thus cutting down available voltage and current for the transformer. When a device of this character begins to deteriorate, it goes from bad to worse very quickly.

In vibrators where the driving contacts also carry the working circuit current, it is necessary to use expensive contact material. This is because oxidation affects the contact surfaces. With a vibrator having separate driving contacts, however, the current density is low and small contacts of good material may be used. The working circuit contacts may be of inferior material since they are positively driven by the vibrating element independently of the nature of contact established. After the first few impacts, the oxide is rubbed off and perfect contact is established for the work circuit.

Furthermore, it is desirable to break the contacts in the smallest time interval possible to avoid arcing. Where the contacts are spring mounted and do not have any rigid abutment to give a hammer break, it has been very difficult to obtain a quick break. Usually in such a case, the break occurred when the contact was near its extreme position and traveling with low velocity. In the vibrator to be described, however, the contact is broken at the center position of the movable contact where the velocity is a maximum.

An object of this invention is to devise a vibrator which will operate satisfactorily over long periods of time. Another object is to devise a structure of this character which will be simple and cheap and which will operate quietly.

Referring to the drawings, Figure 1 shows a sectional elevation of a vibrator, embodying the present invention. Figure 2 shows a view of the same vibrator in partially disassembled condition and at right angles to Figure 1. Figure 3 is a detail of the top rubber damping member. Figure 4 is a detail of the bottom rubber supporting member. Figures 5 to 8, inclusive, are details of a vibrator reed. Figure 9 is a view partly in section similar to Figure 2, except that the vibrator is in assembled position. Figure 10 is a circuit diagram of the vibrator.

Referring to the drawings, the vibrator comprises a generally U-shaped frame, 1, of magnetic material, such as iron. Frame 1 has a bight portion 2, in the center of which is mounted a pole piece 3. This piece is preferably narrower than frame 1, as shown in Figure 2, and extends downwardly toward the open arms of frame 1. Pole piece 3 has a tip 4, which is offset from the body of the pole piece, so that tip 4 is eccentric with respect to the two arms of frame 1. Pole piece 3 may be fastened in bight portion 2 in any manner, such as by projecting through an aperture in bight portion, and spreading the metal on the outside.

Disposed around pole piece 3 is a spool 5, preferably containing two windings and connected in a manner to be later described. Frame 1 is composed of two arms, 10 and 11, connected by bight portion 2. Arms 10 and 11, preferably have their ends, 12 and 13, bent toward each other at regions 14 and 15. Between ends 12 and 13 is clamped the entire vibrator system.

This comprises a reed generally designed as 20 and to be described in further detail later. Said reed carries a movable driving contact, 21, adapted to co-operate with a fixed driving contact, 22, adjustably mounted on threaded portion 23 in arm 11 of the frame. Contact 22 may be adjusted to any desired position and locked therein by means of a nut 25. In addition, reed 20 carries a pair of movable contacts, 26 and 27, adapted to co-operate with fixed contacts, 28 and 29.

Reed 20 is maintained in position by having its end 30 rigidly clamped between a series of metal spacer plates 31 and 32. Next to these plates 31 and 32 are disposed insulating separators 34, 35, 36 and 37, preferably of mica. Between each adjacent pair of insulators, there is disposed supporting arms 40 and 41, carrying stationary contacts 28 and 29. These arms are spring-like and have a natural frequency substantially higher than the natural frequency of reed 20. Beyond the insulators are additional metallic spacer plates 42 and 43, adapted to snugly fill up the space between ends 12 and 13 of frame 1.

This entire assembly is maintained intact by means of a pair of bolts, 45 and 46. Everyone of the spacers and insulators between ends 12 and 13 are provided with suitable apertures through which these bolts may be threaded. As shown in Figure 1, these apertures are sufficient-

ly greater in diameter than the bolts, so that a suitable insulating region may be formed, which may be occupied by an insulating sleeve. Bolts 45 and 46 are provided with nuts 47, which maintain the entire assembly rigid.

Referring to reed 20, Figure 5 shows the spring suitably punched out. Spring 20 has its bottom portion, 30, provided with the apertures 50 and 51, previously generally described for the reception of bolts 45 and 46. Above bottom portion 30, which is adapted to be rigidly clamped, is a primary pivotal portion, 52. This portion preferably has a small rectangular region, 53, punched out. As is clearly shown in Figure 5, region 53 is symmetrically located with respect to the sides of the spring and has its long dimension transverse to the spring. Above region 52 is a region 55, carrying a pair of rivets, 56 and 57. These rivets are preferably in line with each other on a horizontal axis, and are spaced sufficiently wide apart so that each rivet goes through an outer part of the spring. Above region 55 is a region 60, having a long centrally disposed cutout, 61. This cutout has preferably the same width as portion 53 and is located in line therewith. Cutout 61 has its greatest length along the length of reed 20, and has a small spring 62 therein. This spring is integral with main spring 20 and has an enlarged rounded head, 63, carrying driving contact 21.

The free end 65 of spring 20 is adapted to carry an armature, 66, riveted thereto at 67 and 68. It will be noted that rivets 67 and 68 are preferably co-linear with 56 and 57.

Rivets 56 and 57 are adapted to support on each side of spring 20 rigid arms 70 and 71. These arms are preferably bent so as to flare outwardly and comprise a broad mounting region, 73, of the same width as spring 20, and a narrow contact supporting portion. These arms, 70 and 71, support movable contacts, 26 and 27. Between arms 70 and 71, is supported a rigid arm 74 abutting against spring 62. In the normal position of reed 20, contacts 21 and 22 are tightly closed. To prevent spring 62 from maintaining the contacts in closed position as reed 20 moves away, abutment 74 moving with the main body of reed 20 carries spring 62 with it to open the driving contacts. Hence, in spite of any bias of spring 62 tending to keep the driving contacts closed even after reed 20 has started to move away, member 74 immediately opens these contacts.

As is evident from Figure 1, the entire reed assembly is so supported that in its position of rest, driving contacts 21 and 22 are closed and armature 66 is to one side of pole tip 4. In operation, the interaction between pole tip 4 and armature 66 suffices to cause the reed to vibrate. This vibration results in a flexure at region 52 opening driving contact 21. By virtue of inertia, and the impact with cooperating contact 22, there is also a flexure of spring 62, relative to spring 20. In addition, there is considerable flexure at region 60.

It is evident that the shapes of the cutouts in the reed are such that no definite axis of flexure across the reed is provided. The portion of the reed with the cutout will flex along its entire extent and while the flexure may or may not be uniform along the reed cutout length, nevertheless there will be no sharp variation in flexing characteristics along the cutout length. Obviously flexing goes with stress so that any sharp variation in flexing characteristic along a reed implies a sharp stress variation.

Supporting arms 40 and 41 are preferably resilient enough so that when any one pair of contacts are together they remain so while reed 20 is traveling toward the center position. When the center position has been attained, the contacts separate. Arms 40 and 41 are stiff enough so that their natural frequency is substantially higher than that of reed 20. Hence even though one of these arms is moving towards its extreme position, nevertheless the contact separation is quick and sharp.

The various contact carrying members are provided with soldering lugs, 75, to which may be soldered suitable wires. These wires are threaded through small flexible rubber tubes, 77, of a resilient mounting, 78. This mounting comprises a soft rubber member, having a rectangular cup-shaped portion, 80, adapted to enclose the bottom of the vibrator unit. The bottom of cup-shaped portion 80 has formed thereon a flange, 81, having a projecting rim, 82, surrounding tubes 77. The wires threaded through tubes 77 are preferably soldered to the prongs 85, rigidly mounted in a disk, 86, of hard insulating material. This disk has a circular configuration of approximately the dimensions of rim 82 with the exception of a projection 83. Above this projection is a soldering lug 84 riveted to one of the prongs 85 and in practice connected to the ground wire. As shown in Figure 9, when the vibrator is put into can 87, insulating disc 86 is cocked to permit lug 84 and projection 83 to project through an aperture in can 87.

A metal can, 87, is provided at its open end with a circular constriction, 88, and thereafter with an annular region, 89, terminating in a lip, 90. As is evident in Figure 1, portion 82 is adapted to be jammed under constriction 88. Insulating disk 86 is forced against constriction 88 to jam the rubber in place and the entire assembly is maintained by means of a spring ring, 91. Projection 83 and lug 84 passing through an aperture in can 87 lock the vibrator against turning relatively to can 87. Lug 84 is bent up against can 87 and soldered thereto to ground can 87.

As shown in Figures 1 and 9, when the vibrator is in position inside of can 87, and above insulating base 86, the rubber tubes 77, are distorted from their natural straight position into a bent position. By virtue of the compressing of the rubber tubes and the outer flange 82, the entire assembly is maintained intact in a flexible, but firm, manner.

To prevent excessive displacement of the top end of the vibrator structure, there is preferably disposed a soft rubber cap, 100, over the top of the vibrator assembly. This cap has a downwardly extending flange 101, which is adapted to lie along the top portion of the vibrator structure and two wing portions, 102 and 103, extending from opposite sides, and perpendicular to the line of motion of the reed, adapted to clear the inside of can 87. This entire rubber assembly has a rectangular cross section as shown in Figure 3 for snugly fitting over the top end of the vibrator and while permitting a certain degree of motion, nevertheless tend to dampen the vibration of the structure and prevent contact with the metal can. This is particularly true with the cap positioned as shown. This vibrator mounting is claimed in our divisional application, now Patent No. 2,140,792.

In Figure 8 is shown a modified form of reed for a combined interrupter and rectifier. In this construction, the contact mounting portion 173 has offset arms on each side thereof, as in Figure 6, only one 171 being shown. Each contact bearing portion carries two contacts, 126 and 226. This is adapted to co-operate with a set of stationary contacts 128 and 228, shown in Figure 9, each of these contacts being carried on separate supporting members, 141 and 241. These contact bearing arms are in general similar to the contact bearing arms 40 and 41 of Figure 1, and are supported in the same manner.

Referring to Figure 10, magnetizable member 1 carries two coils 150 and 151 both wound together. Coil 150 has its terminals connected together to reduce the self induced potentials and currents in coil 151 and thus cut down arcing at driving contacts 21 and 22. This is more fully described and claimed in Dressel Patent No. 2,012,123. Coil 151 has one terminal connected to fixed driving contact 21. The other terminal is connected by lead 152 to terminal 153 of a battery. The other terminal 154 of the battery is connected to reed 52 through a suitable switch 155. Fixed contact 26 and 28 are connected through leads 156 and 157 to the ends of a transformer primary, 156. The midpoint of primary 156 is connected to terminal 153 of the battery. Rectifier contacts 126 and 128 are connected through leads 256 and 257 to the ends of the transformer secondary 258. The center of the secondary is brought out as a terminal 259 while another terminal 260 is connected to reed 52 to supply rectified pulsating currents. It is understood of course that in practice, leads 256 and 257 may have to be interchanged to obtain the correct polarity.

Having described this invention, what is claimed is:

1. A vibrator comprising a U-shaped member of magnetizable material, a pole piece disposed in the bight of said U, a magnetizing coil for said pole piece, a spring reed supported at the open end of said U and having an armature in co-operative relationship to said pole piece, a stationary contact carried by said U-shaped member in proximity to said reed, said reed having an elongated portion thereof cut out to leave a small spring arm integral with said reed extending upwardly toward the armature end and having the free end of said small spring adjacent said stationary contact, and a movable contact carried by said small spring and connected with said magnetizing coil for driving the vibrator.

2. A vibrator comprising an elongated magnetizable member having a pole piece, a magnetizing coil for said member and pole piece, a spring reed having one end rigidly supported on said member and having the other free end disposed adjacent said pole piece, an armature carried by the free end of said reed and adapted to vibrate said reed under the influence of a fluctuating magnetic field, a stationary contact carried by said member, said reed having an elongated region adjacent the free end thereof wherein the material is cut out to leave a small spring member integral with said reed and extending toward the free end thereof within said region, a contact carried by the free end of said small spring and adapted to co-operate with said stationary contact, connections with said magnetizing coil and said contacts, whereby said reed is vibrated upon suitable energization of said coil, a pair of stationary contacts, one on each side of said reed carried by said member and symmetrically disposed with respect to said reed, and a pair of co-operating movable contacts carried by said reed for controlling a circuit, said additional movable contacts being mounted on opposite sides of the reed and carried by a portion of the reed located outside of said cutout region.

3. A vibrator comprising an elongated U-shaped magnetizable member having a pole piece at the bight thereof, and a magnetizing coil adjacent the pole piece, a reed supported at the open end of said U, and carrying an armature at the free end thereof and adapted to vibrate in proximity to said pole piece, a stationary contact carried by said U-shaped member, said reed having an elongated cutout with the length of the cutout in line with the length of the reed and being of such shape as to leave a small elongated spring extending toward the free end of said reed and within said cutout, a movable contact carried by the free end of said small spring and adapted to co-operate with the stationary contact, connections between said contacts and magnetizing coil, whereby upon energization thereof vibration of the armature is effected, an additional contact carried by each arm of the U, on each side of the reed, and symmetrical with respect thereto, said additional contacts being disposed opposite a portion of the cutout region in said reed, additional movable contacts carried on opposite sides of said reed for co-operation with said additional stationary contacts, and means for supporting said additional movable contacts from a portion of the reed outside of the cutout region.

4. The structure of claim 3, wherein said reed is provided with an additional cutout region nearer the rigid end thereof and at a point where the reed is free from its support and begins to flex.

5. A circuit make and break device comprising an electro-magnet including a winding and a pole piece, a reed supported at one end and adapted to have its free end vibrate in proximity to said pole piece, said end having a rest position, contacts carried by said reed, one of said contacts being resiliently mounted with respect to said reed, and the remaining being rigidly mounted with respect thereto, a fixed contact co-operating with said resiliently mounted contact and connected to the winding of said electro-magnet for controlling the same, and a pair of spaced contacts on opposite sides of the remaining reed contacts and adapted to co-operate therewith, said pair of fixed contacts being resiliently mounted and each having a resonant frequency greater than the frequency of the reed system, so that separation of contacts occurs at the point corresponding to the rest position of said reed.

6. A circuit making and breaking device, comprising an electro-magnet having a winding and a pole face, a reed supported at one end and having its other end free to vibrate in proximity to said pole face, said reed having a normal idle position eccentric with respect to said pole face, a movable driving contact resiliently mounted and actuated by said reed, a fixed contact co-operating therewith for controlling the winding of said electro-magnet, said two contacts being closed in the idle position of said reed, an abutment vibrated by said reed and adapted to separate said driving contacts upon the attracted

movement of said reed, a pair of contacts rigidly mounted on said reed, said contacts being disposed on opposite sides thereof, and a pair of spaced contacts, each one of said spaced contacts co-operating with one of said rigidly mounted contacts, said spaced contacts being resiliently mounted and having a natural resonant frequency substantially greater than the resonant frequency of the reed, so that separation of contacts occurs at the point corresponding to the rest position of said reed.

7. The structure of claim 6, wherein said rigidly mounted vibrating contacts are secured to said reed at a point nearer the fixed end than the contacts themselves.

8. In a vibratory motor, the combination of a frame having an energizable pole piece thereon, and a reed disposed for movement in response to energizations of said pole piece and having one end secured to said frame, contact means on said reed intermediate its ends, said reed comprising an elongated resilient member having an aperture therein adjacent said one end to cause the free reed to flex initially adjacent said one end, said aperture being non-circular and free of any definite transverse axis of flexure to prevent stress concentration.

9. In a vibratory motor, the combination of a frame having an energizable pole piece thereon, and a reed disposed for movement in response to energizations of said pole piece and having one end secured to said frame, contact means on said reed intermediate its ends, said reed comprising an elongated resilient member having an aperture therein adjacent said one end to cause the free reed to flex initially adjacent said one end and having a second aperture therein adjacent said contact to cause the portion beyond said contact means to flex readily after the contact means has closed a circuit, said apertures being non-circular and being free of any definite transverse axes of flexure to prevent stress concentration.

10. In a magnetic interrupter a base member, an electromagnet mounted thereon, a vibratory reed member having one end clamped to said base and the other end free to vibrate under influence of said electromagnet, a first contact mounted on said reed member, a second contact supported from said base and cooperating with said first contact to open and close a circuit, said reed member having an aperture punched through a portion thereof, said portion being located solely between said clamped end and said contact, said aperture being non-circular and free of any definite transverse axis of flexure to prevent stress concentration.

11. In a vibrator, the combination of a magnetizable U shaped frame having arms long in comparison to the bight, a short pole piece carried by said bight and extending downwardly toward the free ends of said arms, an elongated spring reed rigidly clamped between the free arm ends and extending toward said pole piece, a small armature rigidly carried by the free reed end and adapted to oscillate in front of but out of contact with said pole piece, said reed having an interior portion cut out below said armature and extending downwardly toward the clamped end for a portion of the reed length, an elongated member rigidly fastened at one end thereof on a portion of the face of the reed below the cut out region but above the rigidly clamped portion, said elongated member extending upwardly toward the armature end of the reed but spaced therefrom so as to enable free relative motion between the reed and the end of said elongated member, a contact secured to the free end of said elongated member on the outer face thereof, a co-operating contact therefor and means for mounting said co-operating contact.

12. In a vibrator, the combination of an elongated frame, an electromagnet mounted at one end thereof and having a core extending toward the other end of said frame, a vibratory reed of spring material rigidly clamped at said other end and extending toward the free end of said core, an armature of magnetic permeable material secured to the free end of said reed within the sphere of magnetic influence of said electromagnet, the free end of said reed being adapted to oscillate in front of but out of contact with the free end of said core, said reed having an interior portion cut out below said armature and extending downwardly toward the clamped end for a portion of the reed length, a pair of contact arms rigidly secured at their base to a portion of said reed below at least the major part of said cut out portion and above the clamped region, said contact arms extending upwardly toward the armature end of the reed but spaced therefrom so as to enable non-interfering relative motion between the reed and the ends of said contact arms, contacts secured to the free end of said contact arms on the face thereof, and co-operating contacts therefor supported from said frame.

13. In a vibrator, the combination of an elongated frame, an electromagnet mounted at one end thereof and having a core extending toward the other end of said frame, a vibratory reed of spring material rigidly clamped at said other end and extending toward the free end of said core, an armature of magnetic permeable material secured to the free end of said reed within the sphere of magnetic influence of said electromagnet, the free end of said reed being adapted to oscillate in front of but out of contact with the free end of said core, said reed having an interior portion cut out below said armature and extending downwardly toward the clamped end for a portion of the reed length, a contact arm rigidly secured at its base to a portion of the face of said reed below at least the major part of said cut-out portion and above the clamped region, said contact arm extending upwardly toward the armature end of the reed but spaced therefrom so as to enable non-interfering relative motion between the reed and the end of said contact arm, a contact secured to the free end of said contact arm on the face thereof, and a co-operating contact therefor supported from said frame.

14. In a vibrator of the class described a reed fixed at one end and weighted at its opposite end for vibration, said reed being relatively stiff at its fixed end and being provided with an aperture of substantial size relative to the area of the reed adjacent its free weighted end to render said free end of said reed accordingly more flexible, whereby each interval of contact is prolonged and the contact pressure is rendered more nearly uniform during its period.

15. In a vibrator of the class described a flat, thin vibrator reed fixed at one end and being relatively stiff, the other end of said reed being provided with narrow depending spaced fingers extending along the side margins of said reed, and a weight secured on the distal ends of said fingers whereby the resiliency and flexibility of

said reed is increased at its free end and each interval of contact is prolonged and contact pressure is rendered more nearly uniform during its period.

16. In a vibrator, the combination of a base, an electromagnet and reed mounted on said base, said reed having one end thereof clamped and the other end weighted with an armature and being free to vibrate under the influence of said electromagnet, at least one contact supported on said reed at a region near the clamped end with a small reed part extending to said clamped end and a large reed part extending to said weight, at least one additional contact supported from said base cooperating with said first contact for circuit interruption during reed vibration, said reed having part of its material cut away for most of said large reed part length leaving the large reed part free of any definite transverse axis of flexure to prevent stress concentration whereby the flexing characteristics of said reed are such as to prolong contact closure period.

17. The structure of claim 16 wherein the reed material cut out lies along a central zone lengthwise of said reed.

18. In a vibrator, the combination of a base, an electromagnet and reed mounted on said base, said reed having one end thereof clamped and the other end weighted with an armature and being free to vibrate under the influence of said electromagnet, at least one movable contact supported on each side of said reed at a region near the clamped end with a small reed part extending to said clamped end and a large reed part extending to said weight, a stationary contact on each side of said reed supported on said base cooperating with said movable contacts for circuit interruption during reed vibration, said reed having part of its material cut away for most of said large reed part length leaving the large reed part free of any definite transverse axis of flexure to prevent stress concentration whereby the flexing characteristics of said reed are such as to prolong contact closure periods.

19. In a vibrator, the combination of a base, an electromagnet and reed mounted on said base, said reed having one end thereof clamped and the other end weighted with an armature and being free to vibrate under the influence of said electromagnet, at least one contact supporting arm mounted on said reed at a region near the clamped end with a small reed part extending to said clamped end and a large reed part extending to said weight, said arm extending away from said reed and away from the clamped end thereof to permit relative non-interfering motion, a movable contact supported at the free end of said arm, at least one stationary contact supported from said base cooperating with the movable contact for circuit interruption during reed vibration, said reed having part of its material cut away for most of said large reed part length leaving the large reed part free of any definite transverse axis of flexure to prevent stress concentration whereby the flexing characteristics of said reed prolong contact closure periods.

20. In a vibrator, the combination of a base, an electromagnet and reed mounted on said base, said reed having one end thereof clamped and the other end weighted with an armature and being free to vibrate under the influence of said electromagnet, at least one contact supporting arm rigidly mounted on each side of said reed at a region near the clamped end with a small reed part extending to said clamped end and a large reed part extending to said weight, said arms extending away from said reed and away from the clamped end to permit relative non-interfering motion, a movable contact mounted on the free end of each arm, contacts supported from the base cooperating with said movable contacts for circuit interruption during reed vibration, said reed having part of its material cut away for most of said large reed part length leaving the large reed part free of any definite transverse axis of flexure to prevent stress concentration whereby the flexing characteristics of said reed prolong contact closure periods.

21. The structure of claim 20 wherein the material cut out from the reed is along a central zone.

22. The structure of claim 20 wherein said reed has part of its material cut away at the small reed part leaving the small reed part free of any definite transverse axis of flexure to prevent stress concentration.

23. The structure of claim 20 wherein the contacts supported from said base are mounted on the free ends of arms with the other ends of said arm being supported on said base, and wherein said arms are springs substantially stiffer than said reed.

24. The structure of claim 20 wherein the reed material cut out extends along a central zone and wherein said contacts supported from said base are mounted on contact supporting arms with said arms being substantially stiffer than said reed.

25. In a vibrator, the combination of a base, an electromagnet and reed mounted on said base, said reed having one end thereof clamped and the other end weighted with an armature and being free to vibrate under the influence of said electromagnet, a contact supporting arm rigidly mounted on each side of said reed at a region near the clamped end with a small reed part extending to said clamped end and a large reed part extending to said weight, said arms extending away from said reed on opposite sides and extending generally toward the weighted end to permit relative non-interfering motion, a movable contact mounted on the free end of each of said arms, a stationary contact for each of said reed contacts, said stationary contacts being mounted from said base and cooperating with said reed contacts for circuit interruption during reed vibration, said reed having part of its material cut away from the weighted end down to said mounting region on said reed leaving the large reed part free of any definite transverse axis of flexure to prevent stress concentration.

26. The structure of claim 25 wherein said cutout region lies along a central zone of said reed.

27. The structure of claim 25 wherein said small reed part has a cutout therein.

28. The structure of claim 25 wherein said stationary contacts are mounted on the free ends of arms mounted on said base, said arms being substantially stiffer than said reed.

29. A vibrator comprising an elongated magnetizable member, a pole piece formed in said member, a vibratable reed, having an armature cooperating with said pole piece, means for rigidly supporting the end of said reed remote from said armature on said member, a magnetizing coil adapted to induce a magnetic field in said member and said reed, a stationary contact carried by said member, said reed being of spring

material and having a portion thereof cutout to form a smaller spring within the cutout portion, a contact carried by said smaller spring and adapted to cooperate with said stationary contact, and connections between said contacts and coil.

30. A vibrator comprising an elongated, magnetizable member, a pole piece joined to said member, a magnetizing coil for said member and pole piece, a reed rigidly supported on said member and having its free end disposed adjacent said pole piece, an armature disposed on said free end and adapted to cooperate with said pole piece, a stationary contact carried by said member, said reed having an elongated cutout in the vibrating portion thereof, said cutout being of such shape as to leave a small elongated spring member integral with said reed, and extending with said cutout toward the free end of said reed, a contact carried by the free end of said small spring and adapted to cooperate with said stationary contact, said contacts being connected with said magnetizing coil, an additional contact carried by said magnetizable member and an additional cooperating movable contact carried by said reed at a point outside of said cutout.

31. In a potential changer adapted for use with a direct current source as the B supply of an automobile radio, an article of manufacture consisting of a mechanical interrupter unit comprising a U-shaped base of magnetic permeable material, a magnetic coil positioned between the arms of said base, a core for said coil having one end thereof secured to said base and the other end thereof facing toward the ends of the arms of said base, a vibratory reed of magnetic permeable material mounted between the arms of said base and having the free end thereof extending toward the last-mentioned end of said core with the major portion of the body thereof disposed substantially parallel to the axis of said core, the free end of said vibratory reed thereby constituting one pole of said magnetic coil, an opening cut in the body of said reed and a tongue on said reed and disposed in said opening, a contact mounted on said tongue and a cooperating contact supported independently of said reed and adapted to cooperate with said tongue contact.

32. As an article of manufacture, a mechanical interrupter comprising an elongated base of magnetic permeable material, a magnetic coil having a core with one end mounted on one end of said base and the other end facing toward the other end of said base, an elongated vibratory reed mounted on the last-mentioned end of said base with the major portion of the body thereof disposed substantially parallel to the axis of said core and the free end thereof disposed adjacent to and offset from the last-mentioned end of said core to constitute one pole of said magnetic coil, an opening cut in the body of said reed and a tongue on said reed and disposed in said opening, a contact mounted on said tongue and a cooperating contact supported independently of said reed and adapted to cooperate with said tongue contact.

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