

May 15, 1945.

K. S. DUNLAP ET AL

2,376,131

ALTERNATING CURRENT GENERATOR

Filed Sept. 26, 1942

FIG. 1

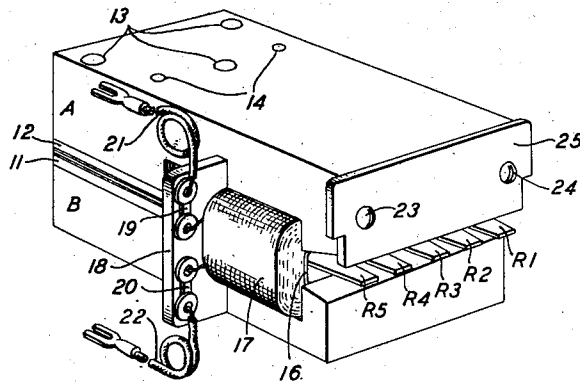


FIG. 2

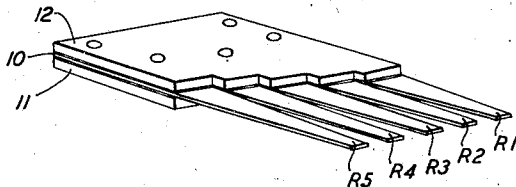


FIG. 4

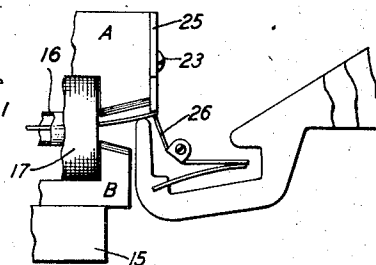


FIG. 3

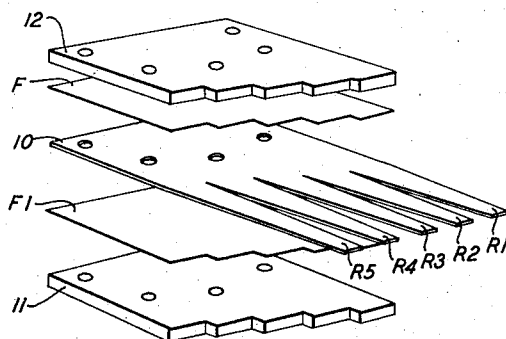


FIG. 5

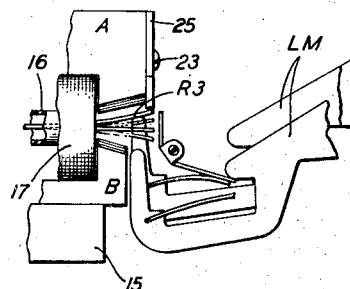
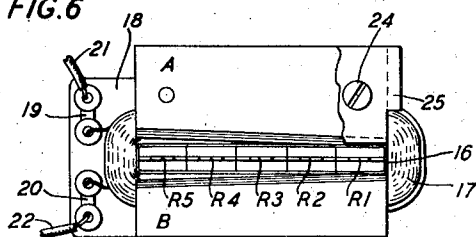


FIG. 6



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2,376,131

ALTERNATING CURRENT GENERATOR

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Application September 26, 1942, Serial No. 459,782

4 Claims. (Cl. 171-209)

This invention relates to alternating current generators of the type in which the operation of differently tuned vibrative elements between the poles of a magnet generate alternating current in a coil of frequencies corresponding to those of the operated elements.

It is an improvement over the alternating current generator used in a call transmitter disclosed in Patent No. 2,352,723, issued July 4, 1944, in the name of R. F. Mallina. In that generator individual rectangularly shaped vibrative elements or reeds are clamped collectively between the pole-pieces of a permanent magnet and two plates under the tightening effect of screws, the plates at their front edges being formed diagonally for the purpose of clamping different length portions of the reeds so as to obtain different periods of frequencies in the operation of these reeds.

The object of this invention is to improve the construction of such a generator and increase the strength of the signals generated by the operation of the vibrative elements.

A feature of the invention is the provision of an unsymmetrical magnet structure to furnish the saturating flux while maintaining a balanced field in the gap.

Another feature is the provision of a magnetic stopping bar attached to the upper pole-piece of the magnet which limits the flexing amplitude of the reeds while furnishing a means of saturating the unused reeds.

Another feature is the provision of a tapered gap formed in the magnet assembly to produce better wave form in the low frequency signals while controlling the output voltage characteristics.

Another feature is the increase of the effective magnet length by the use of brass plates assembled with the reeds to form a unit structure.

Another feature is the use of a magnetic material for the construction of the reeds heat treated in a magnetic field.

Other novel features and advantages will appear from the following description and by the claims appended thereto, reference being had to the accompanying drawing in which:

Fig. 1 is an assembly view of the generator shown in perspective;

Fig. 2 is a view in perspective of the brass plates and reeds assembly;

Fig. 3 is an exploded view of Fig. 2;

Fig. 4 is a partial assembly view showing the reeds actuating mechanism, the reeds being shown in normal flexed position.

Fig. 5 is a view similar to Fig. 4 shown with a combination of reeds released so as to permit the vibration of these reeds between the pole-pieces of the magnet; and

Fig. 6 is a front assembly view shown with the reeds in non-tensioned position.

According to the alternating current generator of this invention, a permanent magnet is formed of the complemented sections A and B, shown in Figs. 1, 4, 5 and 6, having registering portions forming a recess for a coil and a gap. These sections are constructed of a three per cent chrome steel, permitting a relatively narrow gap producing a flux source sufficient to load the reed material to maximum capacity and thereby obtaining the maximum signal to which the reeds are capable. The vibrative reeds R₁, R₂, R₃ and R₄ as shown in Fig. 3, are constructed by punching tapered projections of different lengths from a sheet of a material comprising substantially 34 to 50 per cent nickel, 25 to 40 per cent iron, 20 to 30 per cent cobalt and 1 to 4 per cent molybdenum heat treated by placing the reeds positioned on a permanent magnet in a furnace, raising the temperature of the furnace to approximately 600° C., allowing the magnet and reeds to remain therein for approximately one hour at that temperature and allowing the furnace to cool to room temperature.

Applicants have discovered that partial annealing of the reeds in a magnetic field had the effect of decreasing the hysteresis losses of the material without injury to its mechanical properties, while the mechanical dissipating resistance and the eddy current losses of this material have been found in actual use to be negligible, resulting in a relatively high signal strength.

The plate portion 10 with which the reeds R₁, R₂, etc. are formed, is secured as by brazing between brass plates 11 and 12 using hard solder in the form of foil F and F'. This assembly is afterward clamped between the magnet sections A and B, as by a plurality of rivets 13, in addition to a plurality of screws, not shown, fitted in holes 14 serving to secure the entire assembly on a mounting 15 shown partially in Figs. 4 and 5, while the use of brass plates 11 and 12 considerably increases the effective length of the magnet. The vibrative elements thus assembled extend through an opening in a core 16 of insulating material shown in Figs. 5 and 6 on which the coil 17 is wound, the core 16 being provided with a plate 18 of insulating material having metallic terminals in the form of eyelets 19 and 20 serving to connect the ends of the coil

wire to terminals 21 and 22 in turn connected to the telephone line in a terminal bank (not shown).

The front disposed end portion of magnetic sections A and B when assembled as shown in Figs. 1, 4, 5 and 6 form a tapered gap between which the free ends of the vibrative reeds R₁, R₂, R₃ etc., are operated, these reeds being disposed in relation to the change of space between the pole-pieces with the reed R₃ having the lowest tuned frequency operating at the greatest gap distance.

The reeds R₁, R₂, R₃, etc., as shown in Figs. 4 and 5 extend in operative relation with lever members at LM and when flexed under control of digit key members (not shown) are moved in abutting relation with a plate 25 of magnetic material secured as by screws 23 to the magnet section A, the release of such reeds being effected in predetermined combinations by lever members LM in cooperation with a pawl-like member 26, the operation of which by lever members LM in pairs causing the release of reeds associated with that pair of lever members to permit the vibration of the reeds thus released, while the reeds associated with the non-operated arms LM remain in abutting relation with the bar 25, these operative conditions being indicated in Fig. 5.

According to this construction, the reeds as above mentioned, which are not operated during the transmitting of a particular signal are held against the magnetic abutting stop plate 25 to become saturated with magnetic flux, thus having the effect of decreasing the coil inductance and eliminating the shunt paths that are offered by unsaturated reeds to the alternating flux in the vibrating reeds. Such construction has been found to raise the signal levels by several decibels over those known without decreasing the number of effective signal transmitting operations of the reeds, while the unsymmetrical construction of the gap formed by the magnetic sections A and B has been found to furnish the saturating flux and still maintain the balanced field in the gap which is necessary for good signal wave form.

The reeds R₁, R₂, R₃, etc. are flexed by the operation of their actuating arms LM with amplitudes that produce approximately equal fiber stresses in all reeds, thus enabling each reed to vibrate at its maximum safe amplitude and to generate the maximum voltage of which it is capable. The lowest frequency reeds vibrate at the largest amplitudes which in turn is allowed by the tapered width of the magnetic gap.

What is claimed is:

1. In an alternating current generator, a two-element permanent magnet having registering

securing portions, a reed assembly of resilient material secured between said portions, one of said elements having its free end extending in overlapping relation with the adjacently disposed end of the other of said elements, said elements having portions forming a tapered gap transverse of said reeds, and means carried by one of said elements forming part of the magnetic circuit thereof and serving as a stop for limiting the flexing movement of the said reeds.

2. An alternating current generator comprising a permanent magnet made of two complemental sections, a plurality of reeds of resilient material and brass plates assembled to form a unit riveted between said sections, one end of one of said sections extending in overlapping relation over the ends of the other of said sections, and a plate of magnetic material secured to the overlapping end of said sections for engagement with the free ends of said reeds when flexed.

3. In an alternating current generator, a coil, a permanent magnet made of two independent rectangularly shaped sections having securing portions at similarly disposed ends and their opposite ends forming a tapered gap and a mounting for said coil, a reed assembly, said reeds being resilient and having their free ends extending through said coil for vibrative operation in the gap between said sections, a plate of magnetic material carried by one of said sections against which said reeds are tensioned, and means for releasing said reeds in predetermined combination to cause their vibration, the non-released reeds remaining in contacting relation with said magnetic plate.

4. In an alternating current generator, a per-sections, a coil having a hollow core and a permanent magnet constructed of complemental terminal plate for connecting the wire ends of said coil, said sections having portions forming when assembled a recess for said coil and a tapered gap, a pair of brass plates, a plurality of vibrative elements secured by brazing to said plates to form a unit assembly, rivets for securing said unit between said complemental sections, said elements extending through said coil for flexing operation by an actuating mechanism, and magnetic means carried by one of said sections serving as abutment for limiting the tensioning movement of said vibrative elements and forming part of said magnet with a number of said vibrative elements upon the operation of the other vibrative elements in said combinations.

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