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C. A. LOVELL ET AL

2,309,703

ALTERNATING CURRENT GENERATOR

Filed May 21, 1941

FIG. 1

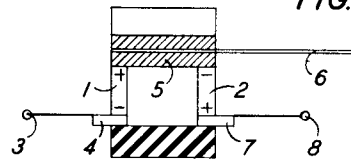


FIG. 2

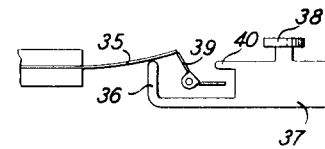
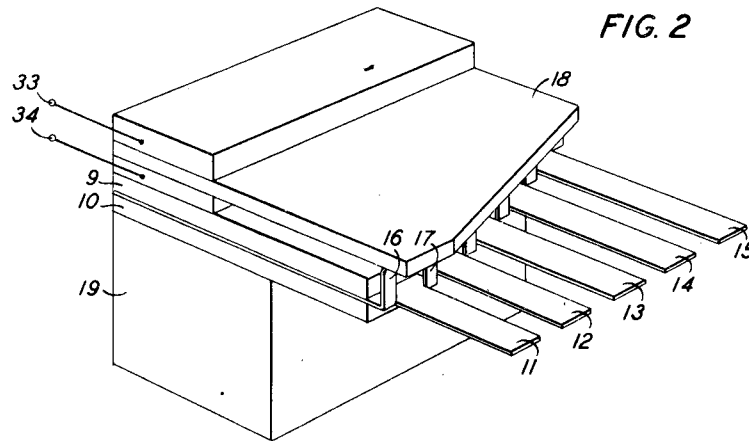
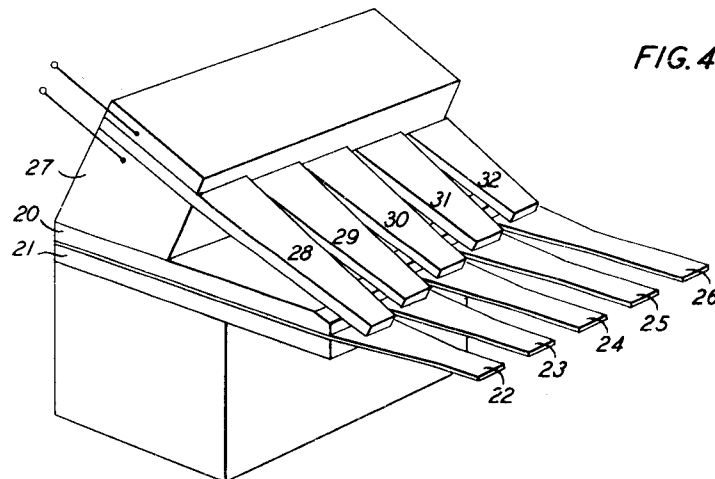


FIG. 4

FIG. 3



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ALTERNATING CURRENT GENERATOR

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Application May 21, 1941, Serial No. 394,462

2 Claims. (Cl. 179—90)

This invention relates to signaling means and particularly to alternating current generators of the type used in telephones for generating alternating current dialing signals representing telephone station designations.

The object of the invention is to provide a simple and efficient alternating current generator of small dimensions. The device of the present invention belongs in that class of generators used in communication systems for signaling by voice frequency alternating currents. Generally speaking, these generators comprise interlinked magnetic and electric circuits operated by a plucked reed designed to have a particular natural period of vibration corresponding to the frequency of the alternating current needed for signal purposes. When the reed is plucked it will vibrate at a sufficient amplitude over a period sufficient to produce an effective signal. In such generators it is usual to employ a plurality of such reeds each of a different dimension whereby a plurality of alternating currents of different frequencies may be generated and which may be transmitted either singly or in combination and in permutation codes representing different telephone designations.

It is the object of the present invention to employ piezoelectric means rather than electromagnetic means to translate the movements of the reeds into the desired alternating current signals. Accordingly an electrical circuit including a piezoelectric crystal is provided for the electric circuit of the alternating current generator. The crystal is mounted in such manner that the mechanical movement of vibration of the reed is communicated to it and hence when the reed is plucked an alternating current is generated in the said electrical circuit by virtue of the peculiar properties of the said crystal.

In one form of the invention the crystal is so mounted that it will be subject to forces of compression and tension and in another form it will be subject to lateral deflection. In either case the working of the crystal will result in the production of an alternating current of the same frequency as the vibration of the crystal.

A feature of the invention is an alternating current generator comprising a piezoelectric crystal mechanically distorted by the movement of a plucked tuned reed.

Another feature of the invention is an alternating current generator comprising a piezoelectric crystal subjected to the forces of compression and tension by a plucked tuned reed.

In accordance with another feature a generator

is provided by mounting a piezoelectric crystal in the anchorage of a tuned reed having one end free for vibration at its natural period.

Another feature of the invention is an alternating current generator comprising a piezoelectric crystal subject to lateral deflection by a plucked tuned reed.

Still another feature comprises the use of a single piezoelectric crystal mounted so as to respond to a plurality of reeds each tuned to a different frequency.

Another feature resides in the use of an individual crystal for each separate reed.

A further feature is a crystal mounting whereby the crystal is brought into mechanical contact with the reed at such a point that both the crystal and the reed will vibrate at amplitudes best suited to their individual characteristics.

Other features will appear in the following description.

The drawing consists of a single sheet having four figures as follows:

Fig. 1 is a cross-sectional schematic drawing showing the principle upon which the generator of the present invention will operate;

Fig. 2 is a perspective view of the generator in which five reeds of different lengths will operate to vibrate a common crystal;

Fig. 3 is a perspective view of an arrangement whereby five reeds will each operate an individual crystal; and

Fig. 4 is a schematic showing of a reed plucking means.

Patent 2,147,710, issued February 21, 1939, to R. F. Mallina, shows a reed type generator as employed in a telephone substation instrument for generating and transmitting from a substation alternating currents of different frequencies for controlling apparatus at the distant end of the line. The generator of the present invention is intended for the same use but operating on a different principle. In the present instance the reed in vibration will communicate its vibration to a piezoelectric crystal which, through its well-known properties, will generate alternating current of the same frequency as the natural period of vibration of such reed. In Fig. 1 two crystals 1 and 2 are employed and a circuit may be traced from one generator output terminal 3 through conducting member 4, crystal 1, a conducting member 5 used as a mount for the reed 6, the crystal 2 and conducting member 7 to the other output terminal 8 of the generator. When the reed 6 is placed in vibration through any one of the well-known means such as that shown in the

Mallina patent above noted, the crystals 1 and 2 will alternately be compressed. The compression and the relief of compression on these crystals will change their conducting capacity in the well-known manner and since this may readily be translated into current variations the effect at the output terminals 3 and 8 will be an alternating current of the same frequency as that of the natural period of vibration of the reed.

Fig. 2 shows an anchorage for a plurality of reeds in the form of two metal plates 9 and 10 to which five reeds 11, 12, 13, 14 and 15 are secured. Each of these reeds is of a different length and therefore of a different natural period of vibration. Each reed at its base portion where it is secured to anchorage plates 9 and 10 is considerably wider than the reed at its free end. Portions 16 and 17 of the reed 11, have been turned up so as to just make physical contact with the crystal 18. When the reed 11 is plucked, the vibration of the reed is communicated through the lugs 16 and 17 to the crystal 18. Through connections at appropriate places made to the crystal 18, such as the terminals 33 and 34, the change due to its piezoelectric properties may be used to translate such vibrations into an alternating current of the same frequency as the natural period of vibration of the reed. It is believed that the schematic representation of Fig. 2 is sufficient for a full understanding of the principle of operation of this device. The block 19 represents any desired means for mounting generators of this type in apparatus such as that shown in the above-noted Mallina patent.

In Fig. 3 two anchor plates 20 and 21 serve to secure a plurality of reeds 22, 23, 24, 25 and 26 each having a different length and therefore of a different natural period of vibration. Mounted above the anchor plates 20 and 21 is a base 27 to which are secured crystals 28, 29, 30, 31 and 32 corresponding respectively to the reeds 22 to 26, inclusive. The crystal 28, for instance, is mounted in such a way that it makes a physical contact with the reed 22 near the base of such reed. When the reed 22 is plucked and therefore set in vibration, this vibration will be mechanically communicated to crystal 28. Through

appropriate electrical connections to the crystal 28 its vibration may be translated into alternating current of a frequency corresponding to the natural period of vibration of the reed 22.

Fig. 4 is a schematic showing of a reed plucking mechanism such as described in the above-noted Mallina patent. The reed 35 is normally stressed upwardly by the finger 36 which is part of the key bar 37. This key bar is held in its normal position by a spring, not shown, and may be depressed by a key 38. On the downward movement of the key bar the reed 35 is freed by the finger 36 but is held by the pawl member 39. When the key bar is further depressed the finger 40 engages the pawl member 39 and by rotating it in a clockwise direction snaps away from the reed 35 thus allowing the reed 35 to freely vibrate.

It is intended that this specification will cover other modifications of this device which come within the spirit of this invention and the scope of the following claims.

What is claimed is:

1. An alternating current generator comprising a plurality of reeds each having a different natural period of vibration, each said reed having one end free and the other end secured, an anchorage for securing said reeds, a piezoelectric crystal having one end thereof secured to said anchorage and the other end thereof in physical contact with said reeds whereby said crystal is subjected to the forces of lateral deflection by the vibration of said reeds and mechanical means for plucking said reeds.

2. An alternating current generator comprising a plurality of reeds each having a different natural period of vibration, each said reed having one end free and the other end secured, an anchorage for securing said reeds, a piezoelectric crystal for translating the vibration of said reeds into corresponding electric currents, said crystal having one end secured to said anchorage and the other end free, each of said reeds having an offset portion thereof intermediate the anchored and free ends thereof in physical contact with the free end of said crystal, and mechanical means for plucking said reeds.

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