

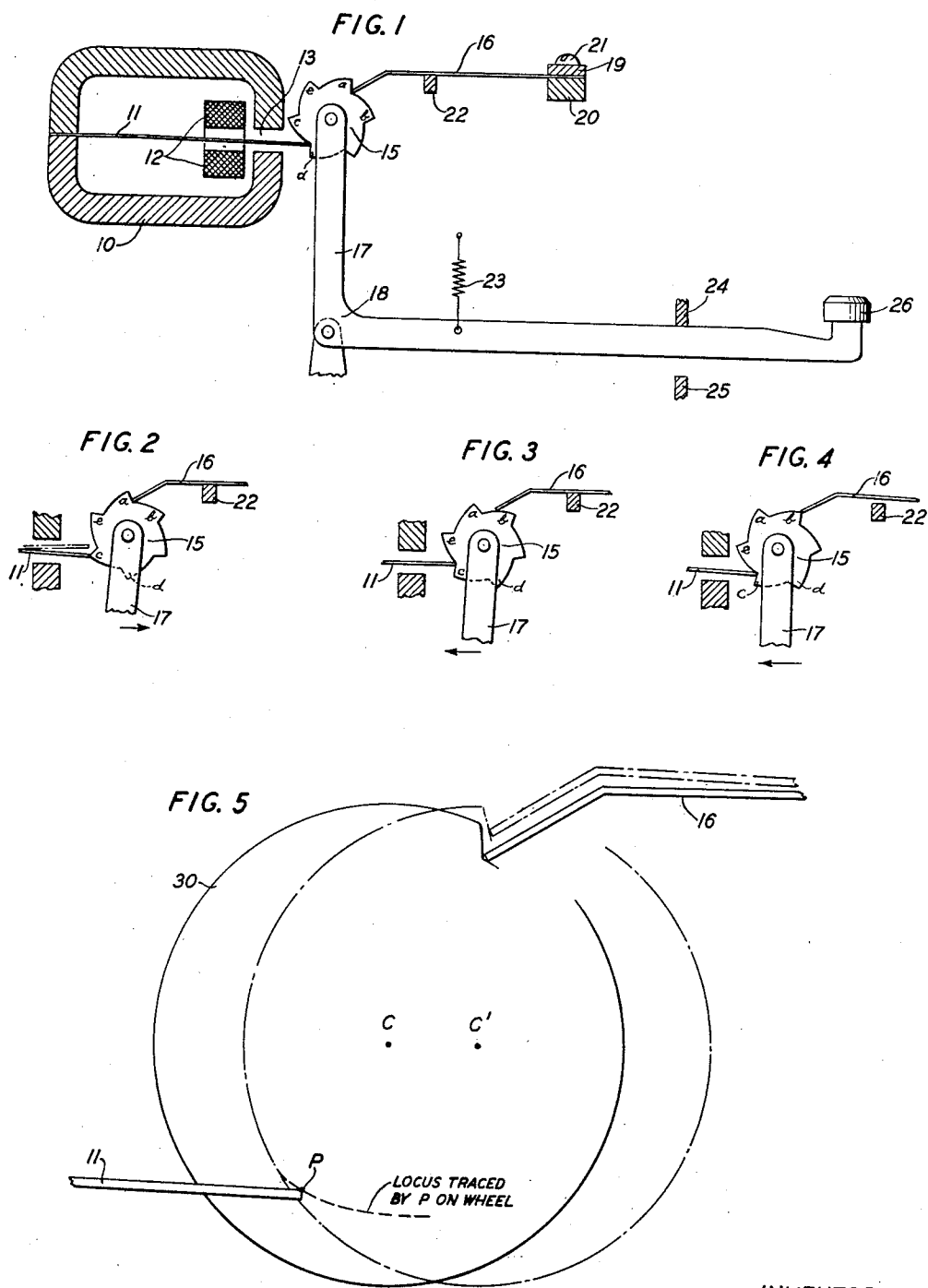
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REED TYPE VOICE FREQUENCY GENERATOR

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REED TYPE VOICE FREQUENCY GENERATOR.

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This invention relates to electromechanical voice frequency generators of the vibrating reed type, such as disclosed in Patent 2,147,710 to F. R. Mallina, and particularly to devices for controlling the operation of the vibratile reeds thereof.

It is the object of this invention to provide an improved mechanism for operating, or plucking the vibratile reeds of a reed type generator which is simple of construction; insures against accidental vibration of the reed when in normal position, that is, between successive damping and plucking operations; and which precludes the possibility of secondary vibration or "double plucking" which would cause false operation of the signal system in which the generator is employed.

This object is attained in accordance with a feature of the invention by the use of a reed plucking device which functions to normally hold the reed deflected, to release it for vibration, to damp the vibrations thereof and finally, to restore it to its normal deflected condition. More specifically, the object of the invention is attained by the use of a rotatable toothed wheel which normally engages the reed and holds it in a deflected condition and which is capable of simultaneous rotational and reciprocating lateral movement whereby the normally deflected reed is released for vibration during the lateral movement of the wheel in one direction and is damped and deflected during the lateral movement of the wheel in the other direction, and in which the contour of the working face of the teeth in the wheel is such as to permit the wheel to rotate while in engagement with the reed and during the lateral movement thereof in one direction, without emphasizing or increasing the extent to which the reed is normally deflected.

The invention will be readily understood from the following detailed description made with reference to the accompanying drawing, in which:

Fig. 1 is a diagrammatic representation of an electromechanical voice frequency generator embodying the reed plucking or actuating device of this invention;

Figs. 2, 3 and 4 illustrate the relative positions of the essential elements of the plucking device in each of three positions thereof occupied during a cycle of operation; and

Fig. 5 is a graphical illustration of the manner in which the special contour of the teeth of the wheel may be obtained.

The harmonic generator is illustrated in Fig. 1 as comprising a permanent magnet 10, a vibratile

reed 11, a pick-up coil 12 and an actuating mechanism for the reed. One end of the reed 11 may be clamped between or otherwise secured to the permanent magnet elements in such a manner as to permit its free end to vibrate in the permanent magnet air-gap 13. The reed 11 passes through the pick-up coil 12 so that, whenever the reed is caused to vibrate in the field of the permanent magnet, a current having a frequency corresponding to the frequency of vibration of the reed is generated in the pick-up coil 12 for transmission over a circuit, such as a telephone line circuit.

The plucking mechanism employed to actuate the reed and cause it to vibrate at its natural frequency of vibration comprises essentially, a ratchet wheel 15, an L-shaped lever 17 and a detent spring or stop 16. The ratchet wheel 15 is rotatably mounted at one end of the lever 17 which is pivotally mounted at its elbow indicated by the numeral 18. The detent spring 16 is rigidly fixed at one end in any suitable manner. As shown, the spring 16 is clamped between two elements 19 and 20 by means of a bolt or screw 21. The elements 19 and 20 may constitute a mounting for a plurality of springs 16 which may be incorporated in an impulse sender of the type disclosed in the above-identified patent. It is to be understood that a plucking unit comprising the three essential elements identified above will be furnished for each vibratile reed 11 embodied in the frequency generator. A stop 22 serves to maintain the spring 16 in a normal position.

The lever 17 is provided with a restoring coil spring 23 which serves to hold the lever in its normal unactuated position against the stop 24 and to restore it to such position after the lever has been operated and released. At its outer end the lever 17 is provided with a key or button 26 which may carry a group of characters, such as 1, ABC2, DEF3, etc., which correspond to the characters of a telephone dial and from which telephone designations may be effected. A lower stop 25 limits the downward travel of the lever 17 when the key or button 26 is depressed to cause the lever to pivot about its elbow 18. Though the lever 17 is illustrated as being a single element capable of actuation by the user of the generator by merely depressing the end thereof, it is to be understood that this has been done merely to illustrate the invention in a simplified manner. In practice, the several reed actuating devices, when employed in a telephone designation transmitter, would be actuated by a mechanism in

which ten push-buttons or keys are made to operate the plucking mechanisms singly or in pairs according to a predetermined code, as in the above-identified Mallina patent.

5 The free end of the detent spring 16 is located normally between a pair of adjacent teeth on the ratchet wheel 15 and, as will appear presently, is adapted to hold the ratchet wheel against rotation during the downward travel of the free end of lever 17 and to ride over the working face of a ratchet tooth during the return movement of the lever 17.

The various parts of the reed type generator are illustrated in their normal positions in Fig. 1. In this condition of the generator, the free end of spring 16 is located at the point intermediate the adjacent teeth *a* and *b* and impinges against the rear face of tooth *a*, whereas the free end of the reed 11 engages the ratchet at a diametrically opposite point between adjacent teeth *c* and *d*. In this position of the lever 17, the reed 11, as shown in Fig. 1, is flexed and is maintained in this condition as long as the lever is unactuated. When the free end of the lever is depressed, the lever pivots about its elbow 13 and in so doing, causes the ratchet supporting end of the lever to move to the right, as indicated by the arrow in Fig. 2. In so moving, the lever carries the ratchet wheel 15 with it, but due to the engagement of the free end of spring 16 with the rear face of tooth *a*, the ratchet wheel is caused to rotate in a counter-clockwise direction. It is apparent, therefore, that the ratchet wheel 15 experiences two simultaneous motions during the downward travel of the button end of lever 17, one lateral and the other rotational. The free end of the reed 11 accordingly wipes over the working face of ratchet tooth *c* without any further deflection, the tooth contour being such as to insure this feature when the ratchet wheel is simultaneously rotated and moved laterally.

The relative positions of the various elements of the generator when the lever 17 has been fully actuated are illustrated in Fig. 2. It will be noted that when the ratchet wheel reaches the limit of its lateral movement to the right, the free end of the reed 11 rides off the working face of tooth *c*, is liberated and permitted to vibrate at its natural frequency of vibration.

When the key end of lever 17 is released and spring 23 functions to restore the lever to normal position, the ratchet wheel moves laterally in the direction of the arrow shown in Fig. 3. As a result, the free end of reed 11 is engaged by the ratchet wheel at the point connecting adjacent teeth *c* and *e* and the reed is thus damped. As the ratchet wheel continues its lateral movement to the left, the free end of reed 11 serves to continue the counter-clockwise rotation of the wheel by virtue of its engagement with the rear face of tooth *c*, and the free end of detent 16 rides over the working face of tooth *b*. As the ratchet wheel continues its lateral movement to the left and also its counter-clockwise rotation, the free end of reed 11, being confined between adjacent teeth *c* and *e*, is again flexed and the free end of spring 16 rides off the edge of tooth *b* as illustrated in Fig. 4 and assumes a position corresponding to the position shown in Fig. 1, that is, the normal position.

From the foregoing description it is evident that one complete operation of the lever 17, that is, one depression of its key end followed immediately by its release, causes the normally flexed reed 11 to be released for vibration, to be damped

and then to be flexed again and finally, to be held in its flexed condition until the lever is again actuated.

Each time the reed is freed for vibration, its operation in the permanent magnet field causes a current to be generated in the pick-up coil 12, which current is of a frequency corresponding to the frequency of vibration of the reed 11.

The device described above and which constitutes the subject-matter of this invention fulfills all the conditions which must be satisfied for the successful operation of a reed type generator. The reed is not subject to any secondary vibration or "double plucking" which causes false operation of the signal system in which the generator is employed, that is to say, it is held practically motionless between successive damping and plucking operations. It is also simple of construction; it does not require excessive projection of the reeds beyond the pole faces of the permanent magnet; the reed deflection is not appreciably affected by the amount of wear anticipated in ordinary service and there is no possibility of the mechanism being left in an indeterminate or partly operated condition by failure to complete the lever stroke.

Fig. 5 illustrates how the special tooth form is generated. The full circle 30 is to be considered the ratchet wheel in its initial position, with no teeth cut except for one rear face to engage the detent 16. *P* is a fixed point representing the end of the reed 11 when deflected the desired amount. Then when the mechanism is operated, the center of the ratchet wheel moves from *C* to *C'*, the wheel moves to the position indicated by the broken line, and the locus traced by *P* on the wheel blank as the blank moves is the desired tooth profile.

Though the ratchet wheel is illustrated having six teeth, the number of teeth is not critical.

What is claimed is:

1. The combination in a reed type generator of a vibratile reed fixed at one end and having its free end extending beyond the poles of an electromagnetic device and means for controlling the operation of the vibratile reed comprising a toothed wheel so positioned with respect to the free end of said reed as to engage the reed between a pair of adjacent teeth and hold it normally flexed, and means for simultaneously rotating said wheel and moving it laterally in a direction away from the free end of said reed to effect the release of the free end of said reed and cause it to vibrate between the poles of said electromagnetic device.

2. The combination in a reed type generator of a vibratile reed fixed at one end and having its free end extending beyond the poles of an electromagnetic device and means for controlling the operation of the vibratile reed comprising a toothed wheel so positioned with respect to the free end of said reed as to hold said free end flexed between the working face of one tooth and the rear face of an adjacent tooth, and means for simultaneously rotating said wheel and moving it laterally in a direction away from the free end of said reed to cause the free end of the reed to be wiped over by the working face of said one tooth and released for vibration, the contour of the working face of said tooth being such that the free end of said reed is maintained in its original condition of deflection until the reed is released.

3. The combination in a reed type generator of a toothed wheel, each tooth thereof having a rear face and a working face, a detent normally im-

pinging against the rear face of a tooth in said wheel, a vibratile reed fixed at one end and having its free end normally deflected by the working face of another tooth in said wheel, and means for moving said wheel laterally to render said detent effective in causing said wheel to rotate during its lateral movement and to cause the working face of said other tooth to wipe over the free end of said reed whereby said reed is released for vibration.

4. The combination in a reed type generator of a toothed wheel, each tooth thereof having a rear face and a working face, a detent normally impinging against the rear face of a tooth in said wheel, a vibratile reed fixed at one end and having its free end normally deflected by the working face of another tooth in said wheel, and means for moving said wheel laterally to render said detent effective in causing said wheel to rotate during its lateral movement and to cause the working face of said other tooth to wipe over the free end of said reed whereby said reed is released for vibration, the contour of the working face of said other tooth being such that the normal deflected condition of said reed is maintained undisturbed during the combined lateral and rotational movement of the wheel and until the reed is released for vibration.

5. The combination in a reed type generator of a reed fixed at one end and having its free end extending beyond the poles of a permanent magnet and means for controlling the operation of said reed comprising a toothed wheel having a tooth thereof maintaining the free end of said reed in a normally deflected condition, and means for simultaneously rotating said wheel and moving it laterally in a direction away from the free end of said reed whereby the working face of said tooth wipes over the free end of said reed without further deflecting the reed and releases the reed from vibration.

6. The combination in a reed type generator of a reed fixed at one end and having its free end extending beyond the poles of a permanent magnet and means for controlling the operation of said reed comprising a toothed wheel normally located with respect to the free end of said reed so that the free end of said reed is confined between the working face of one tooth of said wheel and the rear face of a preceding tooth of said wheel and is maintained in a normal deflected condition, a detent normally confined between the rear face and working face of two other adjacent teeth of said wheel, and means for moving said wheel linearly in a reciprocating manner whereby said detent functions to rotate said wheel during the linear movement of said wheel in one direction and the free end of said reed is released for vibration and engages the rear face of the next succeeding tooth to cause said wheel to continue to rotate during the linear movement of said wheel in the other direction.

7. The combination in a reed type generator of a rotatably mounted ratchet wheel, a reed fixed at one end and having its free end normally engaging the working face of a tooth of said wheel and deflected thereby, a fixed detent normally abutting the rear face of another tooth of said wheel, means for moving said wheel laterally in a direction away from the free end of said reed to cause said detent to rotate said wheel whereby the free end of said reed wipes over the working face of the tooth which it normally engaged and is released therefrom for vibration, and means for moving said wheel laterally in the opposite direction to cause the free end of said reed to be engaged by the rear face of the tooth wiped over and to act thereon to continue the rotation of said wheel whereby said reed is again deflected and said detent engages the rear face of the next succeeding tooth of said wheel.

8. In a reed type generator, a key operated lever, a vibratile reed, a rotatable toothed wheel mounted on said lever and having a tooth thereof in engagement with said reed and holding it in a normally deflected condition, and means cooperating with said wheel and effective upon the operation of said key operated lever for causing said wheel to rotate and release said reed for vibration.

9. A device for controlling the vibration of a reed fixed at one end, comprising a ratchet wheel having a tooth normally holding the free end of the reed in a deflected non-vibrating condition, the contour of the working face of said tooth being such that when said wheel is simultaneously rotated and moved laterally in a direction away from said reed the free end of the reed wipes over the working face of said tooth without further deflection and is released for vibration when it leaves the working face of said tooth, and means for causing the simultaneous rotation and lateral movement of said wheel.

10. A device for controlling the vibration of a reed fixed at one end, comprising a toothed wheel having a plurality of teeth, the free end of said reed being normally confined between a pair of said teeth and thereby held in a deflected non-vibrating condition, the contour of the working face of each tooth being such that when said wheel is simultaneously rotated and driven laterally in a reciprocating manner the free end of the reed during the lateral movement of the wheel in one direction wipes over the working face of one tooth without further deflection, is released for vibration when it leaves the working face of said one tooth and, during the lateral movement of the wheel in the opposite direction, is engaged by the next succeeding tooth of said wheel and thereby moved to its normal deflected position, and means for simultaneously rotating and reciprocatingly driving said ratchet laterally, said means including said reed.

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