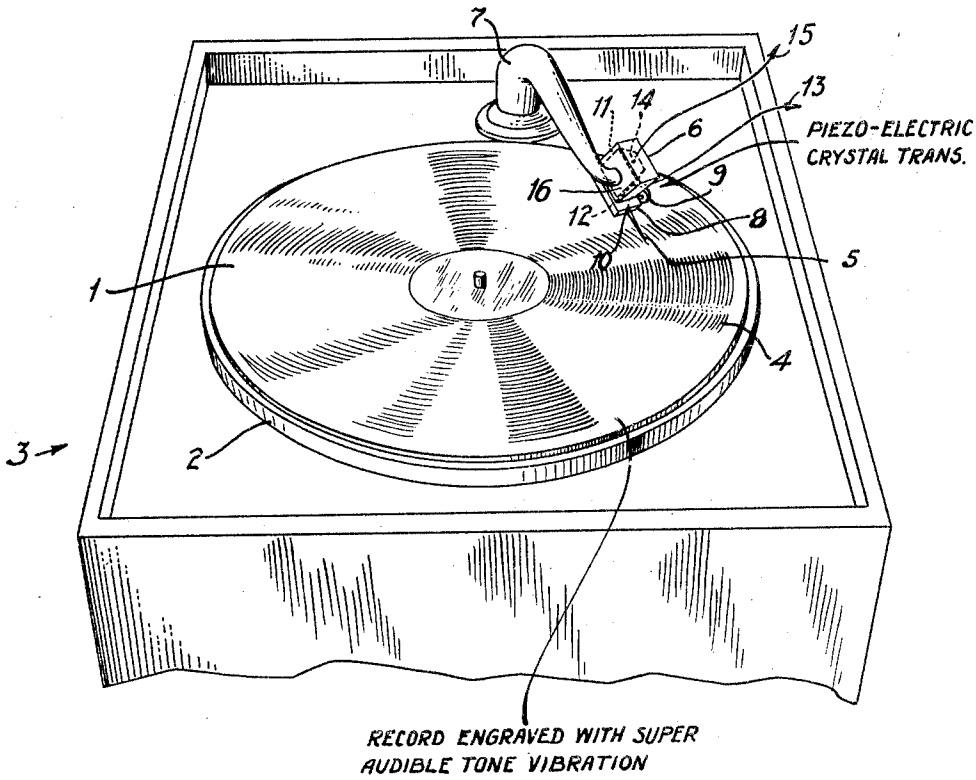
March 31, 1931. A. McL. NICOLSON 1,798,750

SENSITIZED PHONOGRAPH APPARATUS

Filed March 17, 1927



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UNITED STATES PATENT OFFICE

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SENSITIZED PHONOGRAPH APPARATUS

Application filed March 17, 1927. Serial No. 175,988.

This invention relates to a method and means for piezo-electric reproduction of sound and more particularly to a record adapted to coact with the needle of a piezo-electric phonograph transmitter to increase the output of the crystal.

It has been known for a considerable time that by subjecting certain crystals to pressure a difference in electrical potential between different parts of the crystal may be produced. The phenomenon of exhibiting differences in potential between different parts or regions, in response to stresses or strains applied to the crystal, and conversely, the production of stresses, strains, or motion in response to the impression of electrical oscillations thereon, is known as piezo-electric activity. Not only such crystals themselves but also plates or rods cut therefrom in a proper manner exhibit this activity, as is more particularly pointed out in my copending application, Serial No. 155,902, filed December 20, 1926, and entitled "Orientation of component crystal in composite piezo-electric devices." Although such effects may be obtained from crystals of different substances, they are obtained in a marked degree from crystals of the substance known as Rochelle salt or sodium-potassium-tartrate.

It has been found that piezo-electric crystals may be adapted for use as telephone transmitter and receivers, and the like. For such use a piezo-electric crystal may be provided with a pair of electrodes attached to opposite electrical poles of the crystal, and with a needle or stylus holder arranged to communicate to the crystal the vibrations impartd by the record.

When a piezo-electric crystal is used in a phonograph transmitter, the transmitter may be connected either directly or through an amplifier to another piezo-electric crystal which may act as a receiver and produce sound, or to a receiver of any other type. For use in a phonograph transmitter, the device may be mounted in any suitable manner on a phonograph arm to enable the needle or stylus to cooperate with a record disc.

It has been found that an increased output from a crystal may be obtained by the utilization of a variable stress, preferably of a high frequency value, which may produce peaks of stresses (+) and (−) so as to increase the gross values of stresses and hence of resulting electrification and to increase the sensitivity of a crystal and hence the resulting output. This variable stress may be applied mechanically as a shock of high frequency, a musical tone, etc. It follows, therefore, that sound stresses and resultant electrifications in a crystal may be improved by high frequency tones impressed on a crystal so as to give corresponding high frequency stresses.

The record may be engraved in accordance with matter to be reproduced and also in accordance with superaudible tone vibrations. In this manner, the desired variable stresses for increasing the output may be obtained substantially without producing any sound other than that for which the record is produced.

An object of the present invention is to provide novel and advantageous means for increasing the sensitivity and output of a piezo-electric transmitter.

A further object is to provide a phonograph record engraved in such a way as to produce the desired results. Still other objects of this invention will be apparent from the specification.

The features of novelty which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, will best be understood both as to its fundamental principles and as to its practical embodiments, by reference to the specification and accompanying drawing, in which the drawing is a fragmentary perspective view illustrating an application of my invention.

When the needle of a piezo-electric transmitter carried by a phonograph arm is placed in the groove of a phonograph record engraved with the record of the sound to be produced and also in accordance with inaudible and preferably superaudible tone vibrations, the crystal will be vibrated in accordance with the sounds recorded and also

in accordance with the superaudible tones recorded which serve to increase the sensitivity and output of the crystal.

As illustrated in the drawing, a record 1 engraved in accordance with superaudible tone vibrations as well as with audible sounds is placed on a turntable 2 of a phonograph 3 and receives in its groove 4 the needle 5 of a piezo-electric transmitter 6 suitably mounted on a phonograph arm 7 swingable to permit the needle 5 to follow the groove 4.

The piezo-electric transmitter 6 may include a needle holder 8 in which the needle or stylus 5 is held by a set screw 9, a stress plate 10, of metal such as steel, to which the needle holder 8 is connected or of which it is an extension, and to which one basal plane of the crystal 11 is suitably secured, as by cementing, for example with Rochelle salt "melt" comprising Rochelle salt from which the desired amount of water has been removed by heating at a temperature above its melting point, and a crystal 11. The crystal 11 may be provided with one electrode 12 to which a conductor 13 is attached and another electrode 14 to which a conductor 15 is attached. It is to be understood that the precise form and arrangement of electrodes is not, per se, a part of this invention, and that any suitable arrangement of electrodes may be utilized. The conductors 13 and 15 may be connected with a receiver which will produce sound in accordance with the sounds to be reproduced either directly or through an amplifier. The other basal plane of the crystal may have a second stress plate (not shown) secured thereto, and the whole may be enclosed in a suitable casing 16.

While I have disclosed only one embodiment of my invention for the purpose of describing the same and illustrating its principles of operation, it is apparent that various changes and modifications may be made therein without departing from the spirit and scope of my invention. I desire therefore, that only such limitations shall be imposed as are indicated by the prior art, or are specifically set forth in the appended claims.

I claim:

1. In a piezo-electric sound reproducing system the combination of a piezo-electric transmitter arranged to traverse a movable mechanical member bearing a sound record and a high frequency simple harmonic vibration record, said high frequency vibration record serving to sensitize said piezo-electric transmitter.

2. In a piezo-electric sound reproducing system the combination of, a piezo-electric transmitter, a rotatable mechanical record of sound, said piezo-electric transmitter having a stylus adapted to ride upon said record, said record having a super-audible vibration of constant amplitude and frequency formed thereon for increasing the sensitivity and the output of said piezo-electric transmitter.

3. The method of increasing the output of a piezo-electric transmitter at audible frequencies comprising the steps of causing the piezo-electric transmitter to transform sound waves into pulsating electrical energy and simultaneously subjecting the piezo-electric transmitter to inaudible mechanical vibrations.

4. The method of increasing the output of a piezo-electric crystal sound reproducing device at audible frequencies which comprises the steps of vibrating said piezo-electric sound reproducing device at super-audible frequencies and of simultaneously vibrating said device at sound frequencies.

Signed at New York city, in the county of New York and State of New York this 16th day of March A. D. 1927.

ALEXANDER McLEAN NICOLSON.

DISCLAIMER

1,798,750.—*Alexander McLean Nicolson*, New York, N. Y. SENSITIZED PHONOGRAPH APPARATUS. Patent dated March 31, 1931. Disclaimer filed October 27, 1933, by the assignee, *Wired Radio, Inc.*

Hereby enters a disclaimer to claim 1 of said patent, which is in the following words, to wit:

"1. In a piezo-electric sound reproducing system the combination of a piezo-electric transmitter arranged to traverse a movable mechanical member bearing a sound record and a high frequency simple harmonic vibration record, said high-frequency vibration record serving to sensitize said piezo-electric transmitter."

[*Official Gazette November 21, 1933.*]