June 3, 1930. C. W. HOUGH 1,761,831

PIEZO ELECTRIC PHONOGRAPH PICK-UP

Filed Sept. 22, 1926

FIG. 1

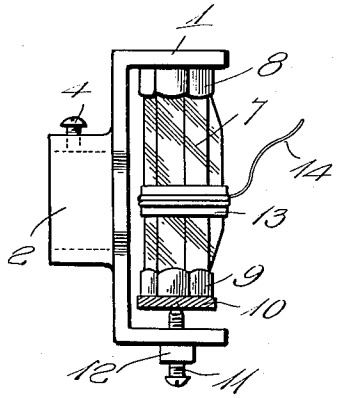



FIG. 2

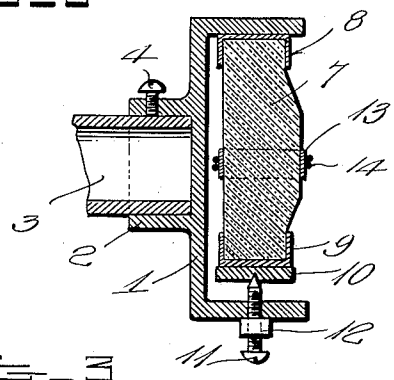
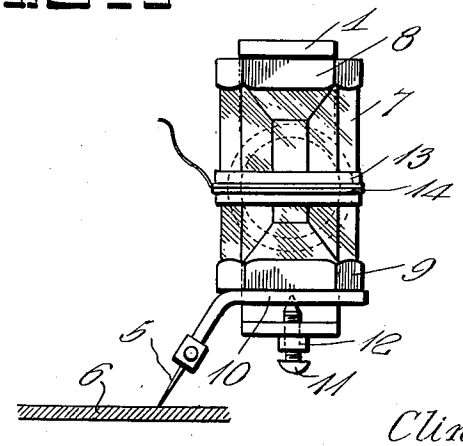



FIG. 3

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# UNITED STATES PATENT OFFICE

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## PIEZO-ELECTRIC PHONOGRAPH PICK-UP

Application filed September 22, 1926. Serial No. 137,129.

My invention relates broadly to the reproduction of sound, and more particularly to a phonograph pickup or microphone.

My invention resides in a method of mounting a piezo electric crystal element for the effective utilization of its piezo electric properties in translating the vibratory movements of a phonograph stylus or diaphragm into corresponding electrical impulses.

The object of my invention is to provide a practical construction of mounting for a piezo electric crystal element which is used as a phonograph pickup or microphone in the reproduction of sound substantially free of distortion.

Another object of my invention is to provide a construction of piezo electric phonograph pickup or microphone wherein a piezo electric crystal element is provided with terminal caps at opposite ends thereof with one end of the piezo electric crystal element mounted in stationary manner and the other end arranged to be vibrated in accordance with the movement of a phonograph stylus for mechanically stressing the piezo electric crystal element and setting up corresponding electrical charges therein, which may be utilized in the operation of an electrical reproducing system.

My invention will be more fully understood from the specification hereinafter following by reference to the accompanying drawings in which:

Figure 1 is a side elevation of the mounting for the piezo electric crystal element; Fig. 2 is a cross-sectional view taken through the mounting of the piezo electric crystal element; and Fig. 3 is a front view of the piezo electric crystal element supported in the mounting of my invention.

Referring to the drawings in detail reference character 1 represents a yoke mounting with a sleeve 2 to fit the standard phonograph tone arm 3; 4 is a set screw to fasten the yoke in place on the tone arm and to permit adjustment of the angle at which the phonograph needle 5 rests upon the phonograph record 6. The piezo electric element 7 is mounted in two conducting terminals 2 and 3, which fit snugly around the ends of the element 7. The upper terminal 8 is rigidly attached to the upper arm of the yoke 1 and consequently holds the upper end of the piezo electric element 7 in a rigid position. The lower terminal 9 is rigidly attached to the needle holding armature 10 which is mounted upon pivot screw 11 and is vibrated by the phonograph record by means of needle or stylus 5. Both the upper terminal 8 and the lower terminal 9 are cup shaped caps which closely fit over the upper and lower ends respectively of the piezo electric element 7. Pivot screw 11 serves as a pivot upon which armature 10 vibrates and as an adjustment to compress the piezo electric element to the point of highest efficiency. Pivot screw 11 is locked into position by lock nut 12. Pivot screw 11 serves to complete the electrical connection between the upper and lower ends of the piezo electric element through terminal 8, yoke 1, pivot screw 11 and terminal 9. Yoke 1 serves as one output terminal of the device. The second terminal consists of a conducting band or girdle 13 affixed around the surface of the center of the piezo electric element, and wrapped by a connecting wire member 14. This construction causes the vibrations of the phonograph needle to be transmitted to the piezo electric element in the form of torsional stresses which generate corresponding electrical impulses at the terminals of the piezo electric element. These electrical impulses are utilized to operate responsive devices such as telephones or amplifiers, loud speaker equipment, and the like.

While I have described a preferred form of the invention, I desire it to be understood that modifications may be made and that no limitations upon the invention are intended other than are imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. In a piezo electric phonograph pick-up, a piezo electric crystal element having piezo electrically active faces at its opposite ends,

a conductive cap closely conforming to the piezo electrically active face at each end of said crystal element, a yoke member including a pair of arms extending parallel to the plane of said conductive caps, one of said conductive caps being secured to the inner face of one of said arms, a screw device extending through the opposite one of said arms to a position adjacent the other one of said conductive caps, and means connected to said last mentioned conductive cap for impressing mechanical vibrations on said piezo electric crystals for the generation of electrical energy therein, according to the impressed vibrations.

2. In a piezo electric phonograph pick-up device, a piezo electric crystal element, a cap embracing the sides of said piezo electric crystal element adjacent each end thereof and abutting with each end surface of the piezo electric crystal element, a conductive member embracing each of said caps and rigidly secured to one of said caps, means extending through said conductive member in alignment with the other of said end caps for mounting said piezo electric crystal element in said conductive member under a predetermined pressure, a stylus carrier connected to said last mentioned end cap for subjecting said piezo electric crystal element to mechanical vibration for the generation of electrical energy in accordance with the impressed vibrations.

3. A phonograph pick-up device comprising a yoke having a pair of parallel extending arms, a piezo electric crystal element having a conductive cap on each end of said element, the conductive cap at one end of said element lying in abutment with one of said parallel extending arms, an angularly bent member having a flattened surface in abutment with the end cap at the opposite end of said piezo electric crystal element, an adjusting screw passing through the other of said parallel extending arms and having a conical shaped end entering a depression in the flattened surface of said angularly bent member, and a stylus carried by said angularly bent member for imparting mechanical vibrations to the end of said piezo electric crystal element.

In testimony whereof I affix my signature.

CLINTON W. HOUGH.