May 12, 1931. A. MEISSNER 1,804,838

CONVERTING ELECTRICAL OSCILLATIONS INTO MECHANICAL MOVEMENT

Filed May 26, 1927

Fig. 3

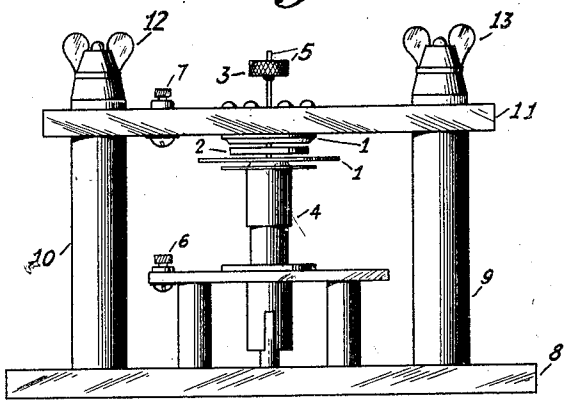


Fig. 1

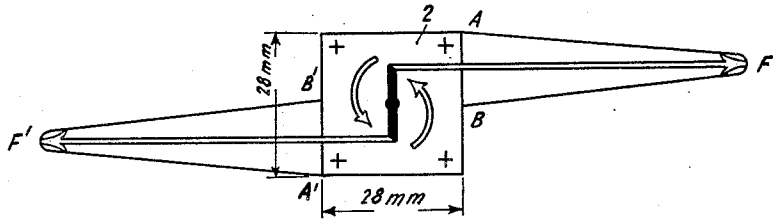
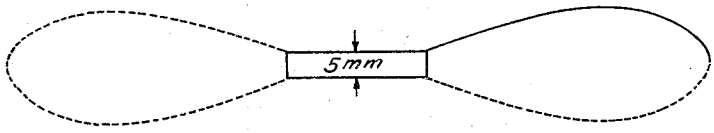


Fig. 2



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CONVERTING ELECTRICAL OSCILLATIONS INTO MECHANICAL MOVEMENT

Application filed May 26, 1927, Serial No. 194,361, and in Great Britain April 7, 1927.

This application is a continuation in part of my application No. 179,726 filed in the United States Patent Office March 30, 1927.

It is a well known fact that if a piezo-electric crystal is excited at its natural period, it undergoes certain mechanical deformations. In investigating these peculiar properties, I have found that if a crystal which is longer in its optical axis than ordinarily required for wave generation, say a crystal of the following dimensions: (optical axis) 5 mm. (electrical axis) 1.5 mm., and 3 mm. at right angles to the optical and electrical axis, is excited by high frequency at its most intense resonance oscilation, in most cases small movements of the crystal can be observed and on moving the crystal around a little it will start to rotate and soon runs up to a high rate of speed.

One of the objects of this invention is to utilize these peculiar properties to produce mechanical motion by electrical oscillations.

Other objects will appear from a consideration of the following specification and the appended claims in conjunction with the drawings in which:

Fig. 1 represents one of the faces of a piezo-electric crystal showing the distribution of forces occurring in said crystal when an oscillating potential is applied thereto.

Fig. 2 shows an end view under similar conditions as in Fig. 1, and,

Fig. 3 shows one possible application of the invention.

To facilitate the explanation of this case, a crystal of a certain size is taken, but it is to be clearly understood that I do not desire to limit myself to any particular size crystal.

If a crystal 28 x 28 x 5 mm. as shown in Figures 1 and 2 is taken, and while being excited at its natural period lycopodium powder is strewn around it, it will be noted that the powder will be blown away at certain portions of the crystal. The intensity and direction of the apparent forces is shown in Fig. 1 by the force triangles, ABF, and A′ B′ F′.

It can readily be seen from Fig. 1 that the resultant forces are equivalent to a couple which tends to twist or rotate the crystal, said couple having a force F and a lever arm L.

A possible method of utilizing this couple to produce rotation is by means of the apparatus shown in Fig. 3. A frame comprising a base 8, posts 9 and 10, and plate 11 is utilized as a proper support for the crystal 2. Crystal 2 has a shaft or spindle 5 running through the center of its faces. 1—1 are the potential plates which are electrically connected to the binding posts 6 and 7 to which the exciting source is connected. At the top portion of the spindle 5 is a disc 3 which may be utilized for observation or for a connection to a means desired to be driven.

The operation of the device is as follows: When the exciting source is connected to the binding post 6 and 7 an oscillating potential will be applied to the faces of the crystal 2 by means of the plates 1—1, thereby creating the aforementioned couple which will cause the shaft 5, disc 3 and crystal 2 to rotate. 12 and 13 are suitable clamping means for the framework.

What I claim as my invention and desire to protect by Letters Patent is:

1. A device for converting electrical energy into mechanical movement which comprises, a pair of stator plates, a piezo-electric body rotatably mounted between said plates, and means to impress an alternating current upon said plates whereby to cause said body to rotate.

2. A device for converting electrical energy into mechanical movement which comprises, a pair of plates, a piezo-electric body mounted between said plates, said plates and said body being mounted to be relatively rotatable, and means to impress an alternating current upon said plates whereby to produce relative rotation between the plates and the body.

3. A device for converting electrical energy into mechanical movement which comprises, a pair of plates, means to connect said plates to an alternating current circuit whereby to produce an electrostatic field, and a piezo-electric body rotatably mounted in said field.

4. A device for converting electrical energy into mechanical movement which comprises,

a pair of plates, means to connect said plates to an alternating current circuit whereby to produce an electrostatic field, a piezo-electric body rotatably mounted in said field, and a mechanical power translating device connected to said piezo-electric body.

5. A device for converting electrical energy into mechanical movement which comprises, a base, a plate, posts joining said base and said plate in spaced relationship, a spindle rotatably supported between said base and said plate, a piezo-electric body fixedly joined to said spindle and rotatable therewith, and means to impress an alternating current field upon said body.

6. A device for converting electrical energy into mechanical movement which comprises, a base, a plate, posts joining said base and said plate in spaced relationship, a support carried by said base, a spindle journaled in said support and said plate, a piezo-electric body fixedly joined to said spindle, and means to impress an alternating current field upon said body.

7. A device for converting electrical energy into mechanical movement which comprises, a base, a plate, posts joining said base and said plate in spaced relationship, a support carried by said base, a spindle journaled in said support and said plate, a second plate mounted upon said support, a piezo-electric body fixedly joined to said spindle and disposed between said plates, and means to connect said plates to an alternating current circuit.

8. A device for converting electrical energy into mechanical movement which comprises, a base, a plate, posts joining said base and said plate in spaced relationship, a support carried by said base, a spindle journaled in said support and said plate, a second plate mounted upon said support, a piezo-electric body fixedly joined to said spindle and disposed between said plates, means to connect said plates to an alternating current circuit whereby to produce rotation of said body, and a mechanical power translating device connected to said body.

ALEXANDER MEISSNER.