

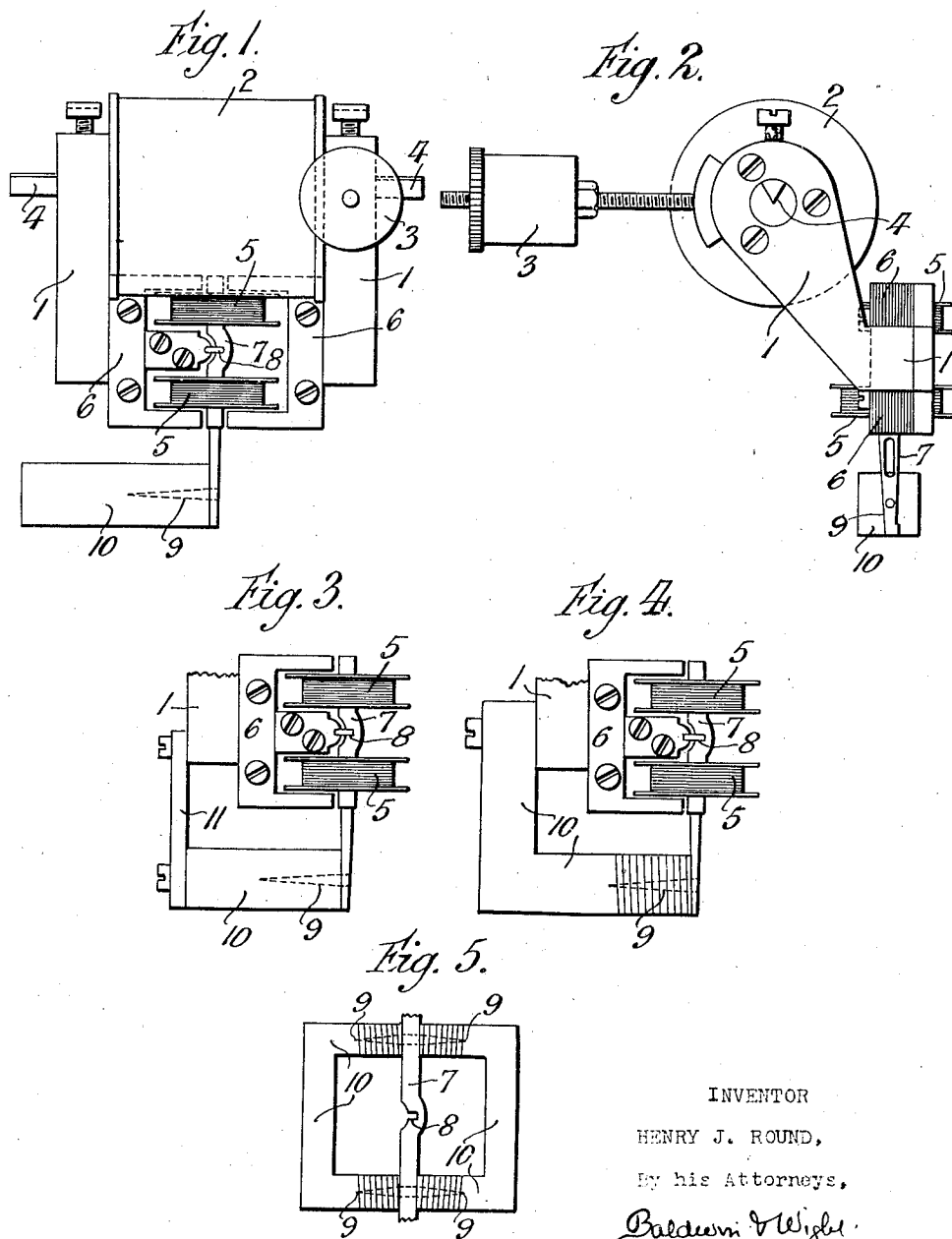
May 14, 1929.

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1,713,195

GRAMOPHONE RECORD CUTTING DEVICE AND THE LIKE

Filed July 11, 1927



UNITED STATES PATENT OFFICE.

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GRAMOPHONE-RECORD-CUTTING DEVICE AND THE LIKE.

Application filed July 11, 1927, Serial No. 204,864, and in Great Britain July 19, 1926.

This invention relates to gramophone record cutting devices, and has for its object the provision of a gramophone record cutting device in which there is a more uniform response over a wide frequency range than is obtainable with constructions at present commonly in use.

In one known construction it has been proposed to attach upon the vibratory arm of a gramophone sound box, a block of rubber or other suitable material for damping the vibrations.

It is very desirable in a wax cutting device for gramophone records, that the response shall be moderately uniform over a wide frequency range, say, from 200 vibrations per second to 5000 vibrations per second. With the usual constructions of moving iron or moving coil armature, the velocity frequency characteristic curve (i. e. the curve connecting the velocity of the movement and the frequency of the applied force) generally shows a pronounced resonance peak, the velocity response at resonance being sometimes as much as 100 times greater than that away from resonance.

It is of course possible to supply the cutting device with power according to a curve which is the inverse of the resonance curve. Such an arrangement, however, is unsatisfactory for the reason that at resonance wax friction is liable to make the action indefinite. Damping is therefore necessary to achieve substantial uniformity of response, without at the same time entirely eliminating resonance effects.

According to this invention the armature or cutter thereto attached of a gramophone record cutting device is damped by means of resilient material attached thereto, in such a manner as to be set into longitudinal vibration as hereinafter described, by the vibrations of the armature or associated cutter, the said material being of such size as almost but not entirely to eliminate resonance. Preferably the resilient material is rubber or the synthetic gum rubber known as "Artgum", and should be of comparatively large size to achieve the desired result.

The invention is illustrated in the accom-

panying drawings, in which Figure 1 shows in side elevation, and Figure 2 in end elevation, one form of construction in which damping is applied to a known form of gramophone recording cutting device. Figures 3, 4 and 5 illustrate each a modified method of applying damping material to a record cutting device.

Referring to Figures 1 and 2, 1 is a magnetic frame carrying a magnetizing coil 2 and adjustable balance weight 3, and adapted to be supported by means of knife edges 4. 5 are coils to which speech or the like currents are fed. These coils co-operate with a laminated magnetic pole piece structure 6 to effect movement of an armature 7 pivoted at 8 and adapted to carry a record cutter. At or near the tip of the armature is fixed a pin or needle 9, about one inch long, the length of the said pin being in the path of vibration of a point on the armature 7. Penetrated and held by this pin is a substantially straight piece of soft rubber (or the material known in the trade as "Artgum") 10, about $\frac{1}{2}$ " square in section and about 2" to 3" long.

It has been found that the rubber or "Artgum" is quite effective if left free at one end, as shown in Figure 1 and 2, but in order to avoid breakage and undesired vibration, it is preferred to attach the damping material at its other end to the frame 1 of the cutting device, for example, by means of an extension plate 11, as shown in Figure 3.

In the modification illustrated in Figure 4, the damping material is extended for about $1\frac{1}{2}$ " and then formed at right angles and bound to the side of the frame 1. In a preferred modification two such damping devices, one on either side of the armature, are provided.

In the modification illustrated in Figure 5, which is particularly adapted to record cutting devices of the balance armature type (all the cutting devices illustrated in the accompanying drawings are of this type), in which both ends of the armature are readily available, damping material is fixed at both ends and on both sides of the armature.

In all constructions the pin or needle should be embedded over its whole length firmly into

the damping material, the said material being preferably lightly bound with tape or the like to prevent its breaking or splitting. Alternatively, the pin may be let into a groove in the rubber and cemented in position.

In practice, it has been found that application of the present invention results in a slight rise in the natural period of the reed or armature, and in a very heavy damping, so that the response at resonance is not more than twice the response at a frequency comparatively remote from resonance, and a very slight electric correction is necessary to produce a substantially level characteristic curve.

What I claim is:—

1. A gramophone record cutting device or the like, comprising in combination a vibratable armature, electro-magnetic means associated with the movements of said armature, and means for almost but not entirely eliminating resonance effects therefrom, said last mentioned means comprising resilient vibration transmitting and damping means of substantial length attached to said armature, longitudinally with respect to the vibrations thereof.

2. A gramophone record cutting device or the like, comprising in combination a vibratable armature, electromagnetic means associated with the movements of said armature, and means for almost but not entirely eliminating resonance effects therefrom, said last mentioned means comprising resilient vibration transmitting and damping means of rubber-like material, attached to said armature, said means being of substantial length and mounted longitudinally with respect to the vibrations of said armature.

3. A gramophone record cutting device or the like, comprising in combination a vibratable armature, electromagnetic means associated with the movements of said armature, and means for almost but not entirely eliminating resonance effects therefrom, said last mentioned means comprising resilient vibration transmitting and damping means of substantial length attached to said armature longitudinally with respect to the vibrations thereof by a pin provided upon said armature.

4. A gramophone record cutting device or the like, comprising in combination a vibratable armature, electromagnetic means associated with the movements of said armature, and means for almost but not entirely eliminating resonance effects therefrom, said last mentioned means comprising resilient vibration transmitting and damping means of rubber-like material of substantial length, penetrated and held by a pin provided upon said armature so as to lie longitudinally with respect to the vibrations thereof.

5. A gramophone record cutting device or the like, comprising in combination a vibratable armature, electromagnetic means as-

sociated with the movements of said armature, and means for almost but not entirely eliminating resonance effects therefrom, said last mentioned means comprising resilient vibration transmitting and damping means of rubber-like material of substantial length, attached to said armature, said material having one end attached to a relatively stationary portion of the cutting device and lying longitudinally with respect to the vibrations of the armature.

6. A gramophone record cutting device or the like comprising in combination a vibratable armature, electromagnetic means associated with the movements of said armature, and means for almost but not entirely eliminating resonance effects therefrom, said last mentioned means comprising resilient vibration transmitting and damping means of rubber-like material of substantial length, penetrated and held by a pin provided upon said armature, said material having one end attached to a relatively stationary portion of the cutting device, and lying longitudinally with respect to the vibrations of said armature.

7. A gramophone record cutting device or the like, comprising in combination a vibratable armature, electromagnetic means associated with the movements of said armature, and means for almost but not entirely eliminating resonance effects therefrom, said last mentioned means comprising resilient vibration transmitting and damping means of substantial length attached to said armature on both sides thereof and lying longitudinally with respect to the vibrations thereof.

8. A gramophone record cutting device or the like, comprising in combination a vibratable armature, electromagnetic means associated with the movements of said armature, and means for almost but not entirely eliminating resonance effects therefrom, said last mentioned means comprising resilient vibration transmitting and damping means of rubber-like material of substantial length on both sides of said armature, said material being penetrated and held by pins provided upon said armature so as to lie longitudinally with respect to the vibrations thereof.

9. A gramophone record cutting device or the like, comprising in combination a vibratable armature, electromagnetic means associated with the movements of said armature, and means for almost but not entirely eliminating resonance effects therefrom, said last mentioned means comprising resilient vibration transmitting and damping means of rubber-like material of substantial length at both ends of said armature, said material being penetrated and held by pins provided upon said armature so as to lie longitudinally with respect to the vibrations thereof.

10. A gramophone record cutting device

or the like, comprising in combination a vibratable armature, electromagnetic means associated with the movements of said armature, and means for almost but not entirely
5 eliminating resonance effects therefrom, said last mentioned means comprising resilient vibration transmitting and damping means of rubber-like material of substantial length on both sides and at both ends of said arma-
ture, said material being penetrated and held 10 by pins provided upon said armature so as to lie longitudinally with respect to the vibrations thereof.

In testimony that I claim the foregoing as my invention I have signed my name this 15 29th day of June, 1927.

HENRY JOSEPH ROUND.