May 20, 1930. W. A. SCHEUCH 1,759,632

ACOUSTIC DIAPHRAGM

Filed July 6, 1925

Fig. 1

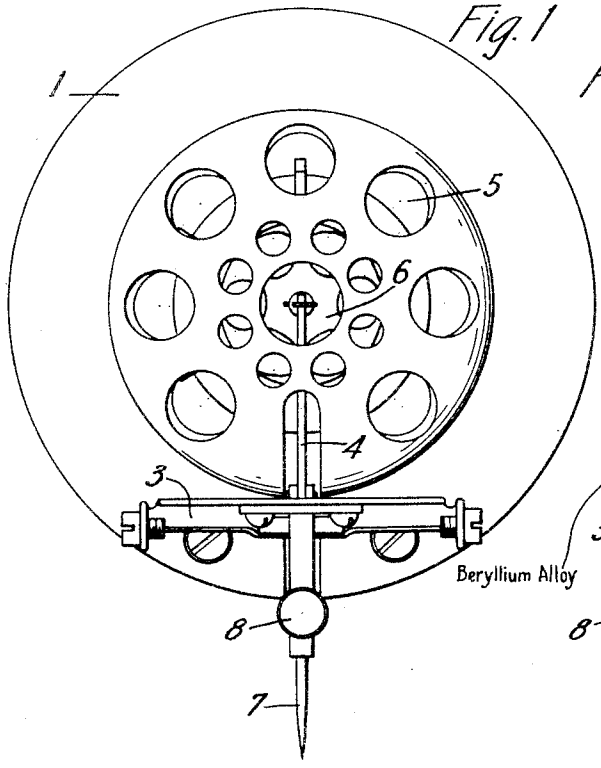


Fig. 2

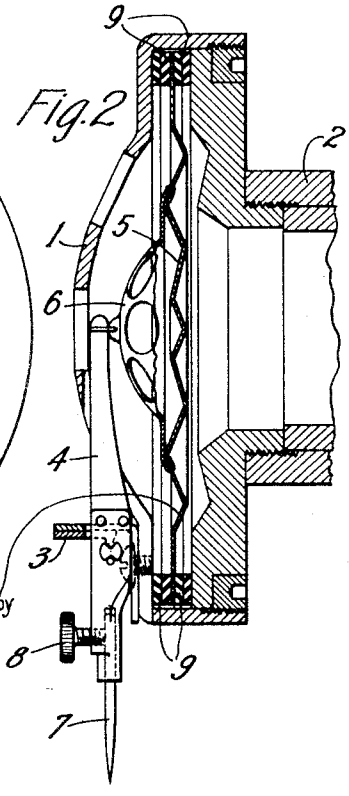
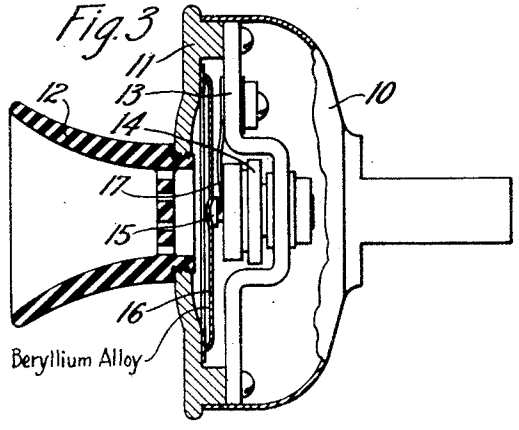


Fig. 3



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UNITED STATES PATENT OFFICE

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ACOUSTIC DIAPHRAGM

Application filed July 6, 1925. Serial No. 41,479.

This invention relates to acoustic diaphragms and particularly those for use in the reception or reproduction of sound.

The general object of the invention is to provide an acoustic diaphragm which is capable of efficiently and faithfully transmitting wave energy over a wide range of sound frequencies and especially improving the transmission of the higher sound frequencies upon which the quality of reproduction so largely depends.

The invention comprises an acoustic diaphragm of the light weight alloys of beryllium for such apparatus as phonograph reproducers, transmitters, microphones and loud speakers. It has been found that beryllium alloys having a high beryllium content are sufficiently malleable that they may be rolled to a thinness suitable for diaphragms and when rolled to such a thinness have a high ratio of stiffness to mass which makes a diaphragm of this material an efficient translator of high frequencies without sacrificing efficiency at low frequencies. Since the material is substantially non-corrosive it may be used without the usual protective coating which increases the diaphragm mass.

For the purpose of more clearly illustrating the invention, several applications of the use of the diaphragm are shown in the accompanying drawings of which Fig. 1 is the front view of an acoustic phonograph reproducer;

Fig. 2 is a cross section taken along the vertical central line of Fig. 1; and

Fig. 3 is a view of a telephone transmitter.

Referring particularly to Figs. 1 and 2 in which like reference characters designate like parts, 1 indicates the phonograph reproducer housing which is mounted on the tone arm 2. Mounted near the lower edge of housing 1 is a transverse support 3 upon which the stylus lever 4 pivots, the upper end of the stylus lever contacting at the geometrical center of the acoustic diaphragm 5 upon which is mounted the spider 6. The stylus needle 7 is seated in a socket on the lower end of stylus lever 4 by means of thumb screw 8. Diaphragm 5 is suspended at its periphery by the soft rubber rings 9.

Referring now to Fig. 3 wherein the diaphragm of the invention is represented as employed in a telephone transmitter or microphone, 10 designates the casing of the receiver in which is mounted the face plate 11 which carries a mouth piece 12 and frame 13 for mounting the transmitter button 14 which has a contact member 15 projecting therefrom into a recess in the center of the diaphragm 16. A cantilever spring 17 keeps the contact member 15 in immediate contact with the diaphragm 16.

In accordance with the invention, diaphragms 5 and 16 are formed of an alloy of beryllium with aluminum or magnesium or both aluminum and magnesium, which alloy melts preferably above 1200° C. This group of alloys produces diaphragms which are particularly satisfactory as regards lightness and strength. Because of its extreme lightness and its consequent low inertia a diaphragm of these alloys responds more readily to minute vibrations of rapidly varying intensities than a diaphragm similar in size made of other materials. A greater response at high frequencies with some improvement in response at the low frequencies, because of the reduced diaphragm impedance, is obtained for a given energy input, that is, a greater and more uniform response is obtained over the whole frequency range.

The qualities desirable for such diaphragms are found to exist to a high degree in those alloys of beryllium with aluminum or magnesium or both aluminum and magnesium in which the beryllium comprises preferably at least 85% of the alloy. The proportions of aluminum and magnesium employed will depend upon the particular use to which the alloy is applied, alloys of lighter specific gravity but of substantially the same strength being produced by the substitution of magnesium for aluminum. The range of alloys of beryllium with aluminum or magnesium or both have been found to possess properties which are more valuable for many purposes, than those of the individual metals. They have, for instance, been found to possess high tensile strength, and high permanence and uniformity of crystal

structure, coupled with a satisfactorily low mass per unit area.

The presence of small amounts of other metals may occur without serious harm and small amounts of manganese may be added as required to obtain a liquidity and uniformity of crystalline structure in the ingot when the behavior of the melt indicates to the skilled workman that there are present sufficient although undetermined impurities to require small quantities of manganese to counteract them. It is not the intention however to claim a quantitative addition of manganese as it is a simple expedient and well known to the art.

Such alloys have greater strength than any of the individual constituent metals and are not appreciably heavier than any of them. They have a low elastic modulus; are permanent in water, either boiling or cold; are particularly ductile and malleable within certain limits; take and retain a high polish; resist atmospheric corrosion and have the necessary quality of impedance and crystal structure for acoustic diaphragms.

While this specification has reference to alloys of beryllium to be used for acoustic diaphragms, it is to be understood that it is not intended to limit the invention to specific percentages of metals or other particular uses set forth but that any changes may be made without departing from the spirit of the invention within the scope of the appended claims.

What is claimed is:

1. An acoustic diaphragm formed of an alloy comprising beryllium as its principal ingredient.

2. An acoustic diaphragm formed of an alloy comprising as essential elements thereof a large percentage of beryllium and a smaller percentage of aluminum.

3. An acoustic diaphragm formed of an alloy comprising as essential elements thereof a large percentage of beryllium and smaller percentages of aluminum and magnesium.

4. An acoustic diaphragm formed of an alloy containing as the principal ingredient an amount of beryllium at least as large as 85%.

5. An acoustic diaphragm formed of an alloy comprising as essential elements thereof, beryllium and aluminum.

6. An acoustic diaphragm formed of an alloy composed of beryllium, aluminum and magnesium.

7. An acoustic diaphragm composed of an alloy comprising as essential elements thereof an amount of beryllium, at least as great as 85% and aluminum and magnesium.

8. An acoustic diaphragm made of an alloy comprising as essential elements thereof, aluminum and beryllium in such proportions as to have a melting point at least as high as 1200° C.

9. An acoustic diaphragm formed of an alloy of beryllium with aluminum and magnesium in such proportions as to have a melting point at least as high as 1200° C.

10. An acoustic diaphragm formed of an alloy composed of a large percentage of beryllium and smaller percentages of aluminum and magnesium.

11. An acoustic diaphragm formed of an alloy composed of the following metals in substantially the following proportions by weight: beryllium 85% and the remainder aluminum and magnesium.

In witness whereof I hereunto subscribe my name this third day of July, A. D. 1925.

WILLIAM A. SCHEUCH.