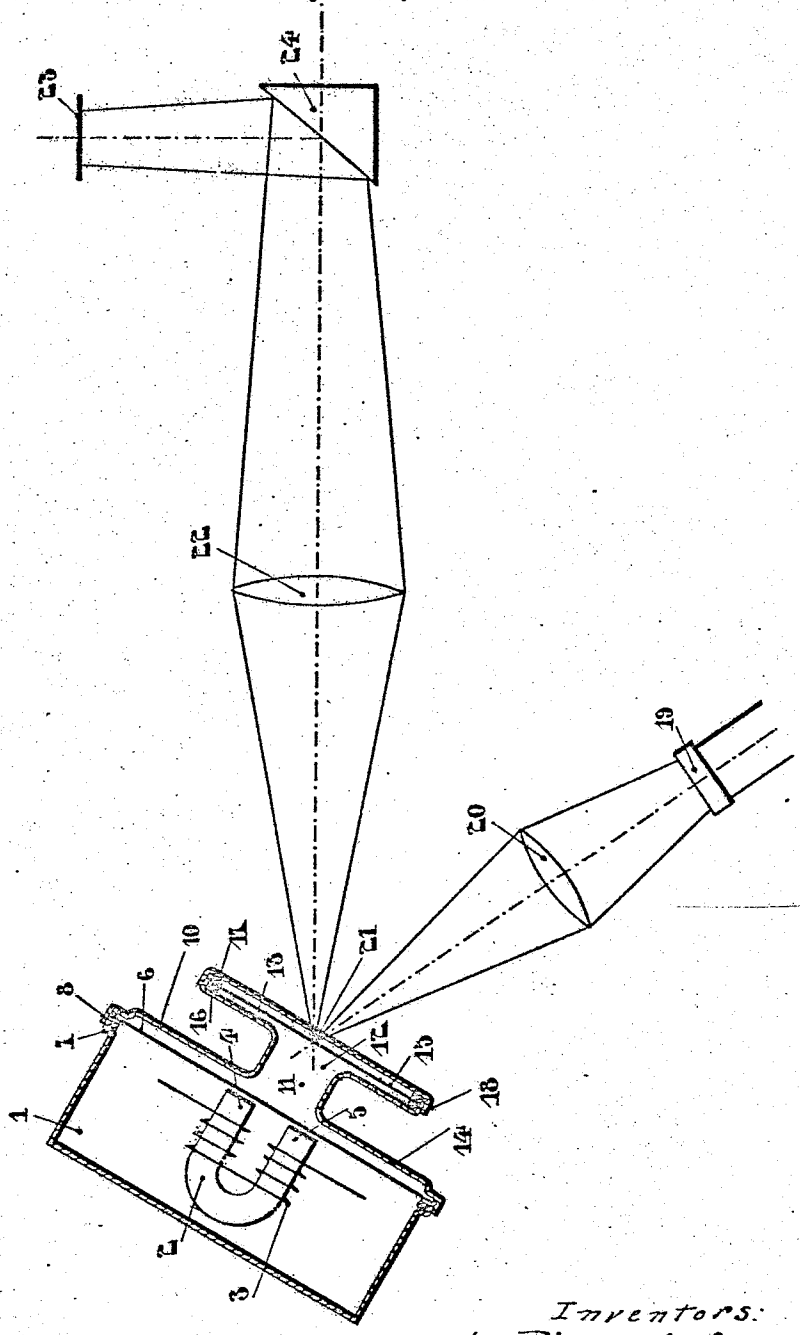
350-360 SR
XR 1,714,443

ADDED

May 21, 1929. L. PINESCHI ET AL 1,714,443

PNEUMATIC VIBRATING CAPSULE

Filed April 28, 1927




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OR IN 179/100.3E

Patented May 21, 1929. 1,714,443

# UNITED STATES PATENT OFFICE.

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## PNEUMATIC VIBRATING CAPSULE.

Application filed April 28, 1927, Serial No. 187,321, and in Germany April 4, 1927.

The present invention has for its object a device consisting of a casing in which vibrations are transmitted by air, particularly applicable to the photographic recording of sounds and characterized by the fact that the vibrations of a metallic diaphragm which is subjected to the influence of an electromagnet the coils of which are traversed by the currents either amplified or not, coming from a microphone, are transmitted to a second diaphragm which is non-metallic, and forms a mirror for reflecting every pencil of light rays which strikes upon it, this transmission being effected by means of a layer of air interposed between the two vibrating diaphragms.

The accompanying drawing shows diagrammatically, and in section through the axis, the casing which is the object of the invention; it illustrates simultaneously in what manner a pencil of light is thrown upon the vibrating mirror for the purpose of its reflection for the photographic recording of the vibrations of the said mirror.

As will be seen from the drawing, the casing which is the object of the invention, comprises a box 1 in which the electromagnet 2 is housed, the coils 3 of which are traversed by a current coming from a microphone which receives the sounds, which current may be amplified by any suitable means; the polar horns 4 and 5 of the electromagnet 2 are located close to the metallic diaphragm 6 and their position with relation to this diaphragm can be regulated.

The diaphragm 6 closes the open portion of the box 1; it rests upon the shoulders 7 of this box with the intervention of a ring 8 of, for example, rubber; a lid 10, screwed upon the box 1, forms an air chamber.

The lid 10 is provided at its centre with an orifice 11 and is in communication by means of a tubular portion 12, with the small case 13 intended to receive the second diaphragm. The whole device formed by the lid 10, the tubular portion 12 and the case 13 is rigid and the lid 10 is pierced by several capillary holes 14 the function of which will be explained hereafter.

The case 13 contains the diaphragm mirror 15; this diaphragm is made of a plate of glass or mica of several hundredths of a millimetre of thickness and is quicksilvered or silvered, so that its external surface forms a mirror; it is secured in the case 13 in the same way as in the diaphragm 6, that is to say, its edges are resiliently held between two thicknesses 16 and 17 made of any suitable material, for example rubber, and held in position by the ring 18 screwed upon the case 13.

The cavity comprised between the diaphragm 6 and the lid 10, the tube 12 and the cavity comprised between the bottom of the case 13 and the diaphragm 15 form an air chamber, having no communication with the atmosphere except through the capillary holes 14.

The vibrations of the diaphragm 6, which result from the variations of the current circulating in the coils of the electromagnet 2 cause successive depressions and compressions of varying amplitudes in the air contained in the chamber described above; these oscillations, the inertia of which is damped by the air evacuated or drawn in through the holes 14, are pneumatically transmitted to the diaphragm mirror 15 which reflects them whilst eliminating the parasitical vibrations arising from the inertia of the diaphragm 6.

A pencil of light, emanating from any suitable source and directed by the lens 19, passes through a condenser 20 the position of which is regulated in such a manner that the apex 21 of the cone of light which it projects is located precisely at the centre of the diaphragm mirror 15; this cone of light, reflected by the mirror, passes through an optical system 22 which imparts to the pencil suitable dimensions so that, whether it falls directly on the recording film 23, or whether it only reaches the latter after reflection from a prism 24 or from a mirror, its section in the plane of the film corresponds to the height of a photogram, this being in order that, when the recording of the sounds is effected upon the fixed film by means of a ray of light traversing a movable slot, such recording may be effected over the total height of the photogram; it will be readily understood that the positions of the optical system 22 and, eventually, of the prism 24 are regulable, so as to allow this adjustment of the dimensions of the section of the pencil of light in the plane of the recording film 23.

The vibrations of the diaphragm mirror, modifying at each instant the luminous intensity per unit of surface in the pencil of

light are recorded photographically upon the film.

It will be readily understood that the necessity of imparting to the pencil of light rays in the plane of the film, a section the diameter of which is at least equal to the height of a photogram, does not become essential except in the case of recording upon a cinematographic film which moves intermittently, and that, if the photographic recording of the sounds is effected upon a strip which is given continuous motion, this condition is not necessary.

The pneumatic vibration casing which is the object of the invention, may be applied not only for the photographic recording of sounds on strips or films but it may also be employed in all industries, laboratories, etc. for recording any vibratory motions, whatever the origin of the latter may be.

According to its particular conditions of employment, the casing which is the object of the invention, may undergo modifications, both in the relative positions of the members which it comprises and in the dimensions and nature of the latter without however, affecting the spirit of the invention.

We claim:—

A device for use in the photographic recording of vibrations of all kinds, comprising a casing, an electromagnet located in said casing, a resiliently-mounted primary diaphragm influenced by said electromagnet and extending across the mouth of said casing, a cover cap to said casing, said cover cap being pierced with capillary air-holes and having a tubular portion connecting two flanged portions of larger diameter, one of said flanged portions extending across the primary diaphragm, a secondary diaphragm having a reflecting surface and supported resiliently within the other flanged portion of said cover cap, and a transparent closing cap for said other flanged portion of the cover cap, substantially as described.

In testimony whereof we have signed our names to this specification.

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