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AUSCULTATION MICROPHONE

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Fig. 1

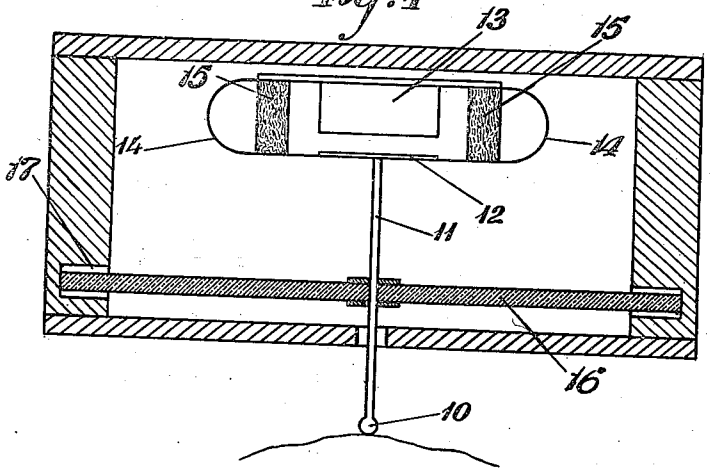
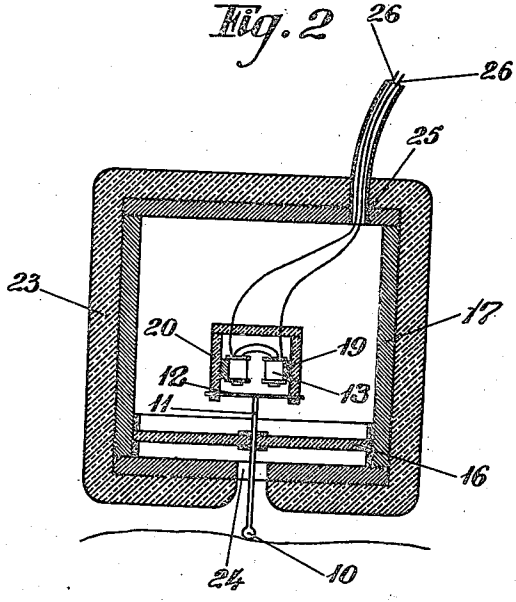


Fig. 2



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AUSCULTATION MICROPHONE

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4 Claims. (Cl. 181—24)

The present invention relates to auscultation microphones, i. e. to electrical apparatus able to transform into electric oscillations the sonorous vibrations of the thoracic wall of a living being, and in a quite accurate manner so as the frequencies exactly coincide with those of the sonorous vibrations and that amplitudes are at any moment proportional.

In auscultation microphones heretofore used, a rod having a pad on one end is in contact with the region to be explored and the other end of the rod bears an armature vibrating in front of an electrical field element, the arrangement of which is different according as the microphone is electro-magnetic, electro-static, electrodynamic, etc.

Hitherto this electrical field element was quite stationary and fixed to the casing of the apparatus and this arrangement presented some drawbacks, as the armature was influenced by the movements of the explored region and particularly by the slow movements of cardiac or respiratory origin. Consequently, relative movements occurred between the armature and the electrical field element and changed the conditions of operation of the microphone, deforming the figurative curves, altering the sensibility of the microphone and sometimes producing parasitic oscillations resulting from non-dampened shocks.

Besides, in most microphones the armatures were not protected and they collected oscillations resulting from external sounds, (for instance articular sounds of fingers of the operator or sounds emitted by the loud-speaking telephone which reproduces the oscillations).

The present invention has for its object to obviate these drawbacks, rendering the microphone insensible relatively to infra-sonorous vibrations, having for instance a frequency lower than 20 or 30 per second and by protecting the movable armature and the electric field element against parasitic acoustic vibrations.

To this effect, according to the invention, the electrical field element of the microphone is supported by the movable armature itself through the intermediary of an elastic support which is dampened either by itself or by a distinct dampener.

The mass of the electrical field element and the elasticity of the support are determined so that this support remains stationary when the vibrations of the movable armature have a frequency higher than the chosen amount (20 or 30 per second).

The dampening of the support is determined so that the whole is aperiodic; in other words, if the field element is moved, it comes back to its normal position without oscillations on both sides from this latter.

Owing to this arrangement, the infra-sonorous vibrations and motions are transmitted through the support towards the field element, so that the relative movements of both parts are small. The sensitivity of microphone and its accuracy are not altered, for it operates in the same conditions as if the electrical field element was stationary.

According to a preferred form of construction the movable armature and the electrical field element are enclosed in a casing, the walls of which are advantageously of metal covered with a protecting material such as thick rubber. The metal protects the delicate parts of the microphone against the electrical or electro-magnetic external actions, and the rubber envelope insulates them perfectly from noise so that the microphone may be used near a loud-speaking telephone reproducing the registered sounds, without untimely entertained oscillations.

The invention is illustrated by way of example in the annexed drawing in which:

Fig. 1 shows diagrammatically the general arrangement of the microphone.

Fig. 2 is a section showing a preferred form of construction of the microphone.

On this drawing are seen some parts of an ordinary microphone, that is to say a pad 10 in contact with the region to be explored and connected by a rod 11 to a movable armature 12 located in front of an electrical field element 13 capable of transforming into electrical oscillations the mechanical vibrations of the armature 12.

In conformity with the invention, the field element 13, having a suitable mass, is borne by the armature 12 itself by yielding supporting constituted by elastic curved blades 14 between branches of which are cushions 15 of a dampening material such as felt, rubber and the like.

The rod 11 is connected to the centre of an elastic cross 16 fixed at the ends of its branches to a casing 17.

The microphone operates as follows:

Owing to inertia of the field element 13 and a periodicity due to cushions 15, the armature 12 is able to vibrate with sonorous frequencies without a substantial movement of the field element 13.

On the contrary the slow and low-frequency motions imparted to the armature 12 are transmitted through the support 14 to the field element 13, so that no relative movement takes

place between the armature and the field element, and owing to this peculiarity, the sensitivity and accuracy of the microphone are not altered.

In the general arrangement of the microphone in conformity with the invention shown on Fig. 1 it is assumed that the supporting means 14 and 15 between the armature 12 and the field element 13 are perfectly elastic and perfectly dampened, respectively.

In practice, any material presents together elasticity and dampening, and the material will be chosen according to the purpose considered.

Thus according to the form of construction shown in Fig. 2, the microphone (of electro-magnetic type) comprises an electrical field element constituted by an electro-magnet 13 fixed to a relatively thick rubber sleeve 20, for instance by means of a suitable adhesive layer 19. A plate 12 forming the movable armature of the electro-magnet 13 is engaged by its ends in the rubber ring 20.

The same microphone comprises also the rod 11, the pad 10 and the elastic cross 16. This latter is fixed at its periphery, to the wall of a metallic casing 17 (of copper for instance) covered by a thick rubber envelope 23.

The casing 17 presents only a lower aperture 24 through which the rod 11 passes and an upper aperture 25 for electrical wires 26 leading to amplifying apparatus the electric currents generated or modulated in the field element 13 by the vibrations of the armature 12.

According to this form of construction the rubber sleeve 20 forms an elastic and dampened connection interposed between the armature 12 and the electrical field element 13.

The metallic casing 17 is an electro-static screen and protects the microphone against external electric disturbances.

The rubber envelope 23 completes the casing as it protects the microphone against outer noise and particularly against sounds coming from fingers of the operator.

It is evident that the invention is not limited to the example which is hereinbefore described and that its construction may be modified in its details without departing from the spirit of the invention.

For instance suitable modifications will be adopted according to whether the microphone is electro-magnetic, or electro-static or electro-dynamic, etc.

In the same way, it is evident that the microphone in conformity with the invention could be used not only for auscultation but to collect sonorous vibrations in a solid body, exclusive of slow movements and of external vibrations.

We claim:

1. An auscultation microphone comprising, in combination, a casing, a rod projecting outwardly from the casing and carrying at its exterior extremity an element adapted to make contact with the part to be auscultated, a movable armature attached to the inner extremity of said rod in the interior of the casing and an electric field element adjacent said armature adapted to transform the armature vibrations into electric oscillations, yielding supporting means for securing said rod on said casing, and other yielding supporting means for securing the field element on the armature.

2. An auscultation microphone in accordance with claim 1, comprising cushioning means between the armature and the electric field element.

3. An auscultation microphone comprising, in combination, a casing, a rod projecting outwardly from the casing and carrying at its exterior extremity an element adapted to make contact with the part to be auscultated, a movable armature attached to the inner extremity of said rod in the interior of the casing, an electric field element adjacent said armature adapted to transform the armature vibrations into electric oscillations, and yielding supporting means for the electric field element secured on said armature, said means comprising elastic blades fixed on the armature and the electric field element, a cushion member being inserted between the armature and the electric field element.

4. An auscultation microphone comprising, in combination, a casing, a rod projecting outwardly from the casing and carrying at its exterior extremity an element adapted to make contact with the part to be auscultated, a movable armature attached to the inner extremity of said rod in the interior of the casing, an electric field element adjacent said armature adapted to transform the armature vibrations into electric oscillations, yielding supporting means for said rod secured on the casing, and other yielding supporting means for the electric field element fixed on the armature, said other means comprising a thick elastic sleeve fixed on said armature and surrounding and supporting the electric field element.

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