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BY A. P. C.

G. GELOSO
DEVICE FOR THE TIGHT PROTECTION OF THE MEMBRANE OF LOUDSPEAKERS AND MICROPHONES FROM ABNORMAL AND EVEN CONSIDERABLE HIGH AND LOW PRESSION
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Fig. 1.

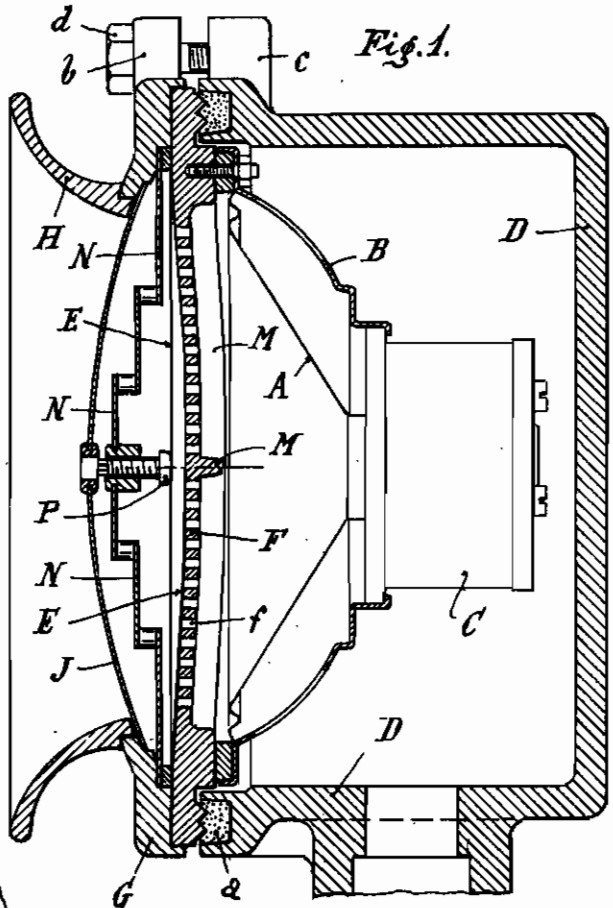

Fig. 2.

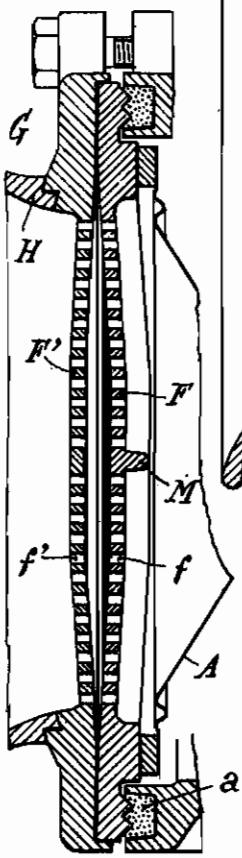

Fig. 3.

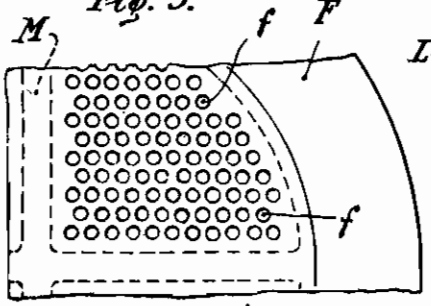

Fig. 4.

Inventor;
G. Geloso
By: Glascock Downing & Seebold
Attys.

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DEVICE FOR THE TIGHT PROTECTION OF THE MEMBRANE OF LOUDSPEAKERS AND MICROPHONES FROM ABNORMAL AND EVEN CONSIDERABLE HIGH AND LOW PRESSION

Giovanni Geloso, Milan, Italy; vested in the Alien Property Custodian

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Among many cases where microphones are used there are such most important ones where the apparatus becomes periodically and more or less suddenly subjected to pression, which is even considerably higher or lower than the usually working atmospheric pression. This happens, e. g. where microphones and loudspeakers fixed on the cover of submarines are concerned which in deep immersion may be subjected to very high pression to the extent of 10 atmospheres and more; this occurs also where microphones and loudspeakers for employment near heavy artillery weapons are concerned, in the closeness of which the atmosphere is shattered by waves of pression and depression of considerable amplitude at the moment of firing. The said strains no acoustic membrane can resist, all the more, as for the function which this membrane is to carry out, it cannot present but a very limited resistance.

In practice we try to remedy the described inconvenience by putting the device in a resistant envelope which is provided with a strong cover which gets tightly fixed when the said circumstances are about to occur (in case of submarines), or by getting the wave of pression to arrive on both sides of the membrane simultaneously (in case of guns); but in the first case the operations for closing the lid require a certain amount of time which is not always at our disposal, and in the second case the device proves mostly to be inefficacious.

The present invention has for its subject a device for the protection of the membrane of loudspeakers and microphones, which is automatically protecting the membrane from the said considerable variations of pression, when they are about to occur and which automatically allows it to continue in its normal efficiency when the normal pression is coming back.

Substantially, the device according to the invention consists of a second membrane, which is tightly fixed to the mouthpiece of the loudspeakers or of the microphone, but vibrating in such a way as to transmit to or from the membrane of the latter the sound waves that it is receiving or transmitting, and in connection with the said second membrane—on that side of it to which it is bending by action of the abnormal high and low pression which is to be made inoffensive—it consists of a thrust bearing lattice wall against which it is resting or fixed because of its bend during the entire length of the said high or low pression.

Lest the membrane is disturbed during its normal work by the said lattice wall the deflection of the concavity of the latter is larger than the maximum deflection that the membrane is presenting for the usual most intense sounds; but it is smaller that the deflection of the incurvation corresponding to the limit of elasticity of the membrane, and that is so, in order that the membrane might detach itself from the thrust bearing wall by its own elasticity and occupy once more its normal working position.

Owing to this structure of the thrust bearing wall the sound waves may reach the sonorous membrane of the microphone by passing through the gaps of the lattice (or vice versa in case of loudspeakers), while on the other hand the framework of the lattice, against which the auxiliary membrane is resting in the described abnormal conditions, is dividing its area into a large amount of small areas, each of which must resist a proportional fraction only of the total thrust that is exercised by the abnormal pression upon the whole area of the membrane.

According to another feature of the invention, which is relating to the first, the area of each gap of the lattice wall is designed in such a way that the operating abnormal pression exerts a thrust upon it which is lower than that which the corresponding part of the membrane is able to resist elastically by its own resistance, while the thrust bearing wall is so robust as to resist the entirety of the said thrusts exerted by the abnormal pression on the whole extension of the membrane.

When the formation of either excessive high pression or of excessive low pression only is designed, the thrust bearing wall may be only one which is placed on that side of the auxiliary membrane toward which it is bending, i. e. it presents the convexity; when, on the other hand, the formation of both excessive high and low pression is designed, the auxiliary membrane is provided with a thrust bearing wall on every side, making it thus possible for the membrane to bend in both directions.

With a view of facilitating clear and thorough comprehension of the invention two examples of realization of the same are illustrated in the attached drawings. In detail represent:

Fig. 1 the first example seen in diametrical section;

Fig. 2 the second example seen in analogous fragmentary section;

Fig. 3 a fragmentary frontal view of the thrust bearing wall;

Fig. 4 an enlargement of a detail of the latter.

In the example of Fig. 1, designed for the case of excessive high pression only the membrane A of the loudspeaker or microphone is fixed with its framework B and with the electric set C in a robust envelope D and to the mouth of same the device according to invention is fastened tightly by means of packing *a*, the device which consists of an auxiliary membrane E and of a concave thrust bearing wall F which is placed on the rear of the membrane. This device is held in position by a ring G which is fixed to the envelope D by means of the flanges *b*, *c* and bolts *d* to which may also be fixed the customary mouthpiece H of the apparatus. Before the membrane A a simple mechanical network guard of wire J is fixed in the mouthpiece.

As we already pointed out is the wall F lattice-shaped. In the illustrated case the latter is formed by a quantity of gaps *f* which are crossing the wall itself. When the amplitude of these gaps is excessive as compared with the designed excessive high pression, i. e. when it is such that the thrust on that part of the membrane which is corresponding to each gap is exceeding the maximum load admitted for it, this amplitude is again subdivided into parts by means of a cross wire L which is fixed between the wall and the membrane and brazed to the wall itself, as illustrated in Fig. 4.

In this case the thrust due to the excessive high pression is distributed in many elementar thrusts on the membrane, which are proportional to the areas of the gaps of the cross wire, which thrusts are so small that every element of the membrane is quite able to resist them; these thrusts are then totalized along each lattice of the cross wire, a lattice which in spite of being of limited dimensions is still quite in a position to support them without permanent deformation; and, finally, the thrust totalized by the cross wire are transmitted by it to the wall which supports with its thickness and with possible ribs M with which it can be provided, the total thrust operating upon the whole area of the membrane without prejudice.

In the upper part of Fig. 1 the auxiliary membrane E is in its usual free position, while in the lower part of the same figure it is in the position which it is occupying under the action of the abnormal high pression, i. e. it is adhering to wall F. In the cavity between the grid J and the membrane E is also preferably fixed a diaphragm with concentric spaced rings N which is able to avoid that the membrane E might become deteriorated through the grid itself. In the central part of this diaphragm is also preferably designed an adjustable plug P which is made resting or pressing against the membrane E in order to avoid that this makes parasitary vibrations by its own movement, not impeding, however, the transmission of sounds to or from the membrane A of the loudspeaker or microphone.

In the example of Fig. 2 the case of a loudspeaker or microphone is designed which is able to resist both excessive high and low pression. In this case, there is besides the wall F behind the membrane E also an analogous wall F′ designed before it, so that the membrane may find a thrust bearing site to whichever part it is bending. The wall F′ may also not be provided with ribs as the excessive low pression can reach at its highest the value of an atmosphere in contrast with the excessive high pression which can reach 10 atmospheres and more.

We would emphasize that the device, besides that it protects the membrane of the loudspeaker or microphone from the feared excessive high or low pression has also the advantage of presenting a water-tight wall, so that the apparatus may be immersed into fluid without danger of being deteriorated in some way.

It is obvious, and expressly emphasized, that although the illustrated and described examples present already excellent characteristics of structure and work, these are not limiting in any way the scope of the invention, i. e. that also any other form of execution adhering to the aforesaid concept of the invention falls into the province of and is protected by the present sole rights.

GIOVANNI GELOSO.