March 28, 1944. A. UEBERSCHUSS 2,345,078

CARBON MICROPHONE

Filed March 24, 1941

Fig. 1.

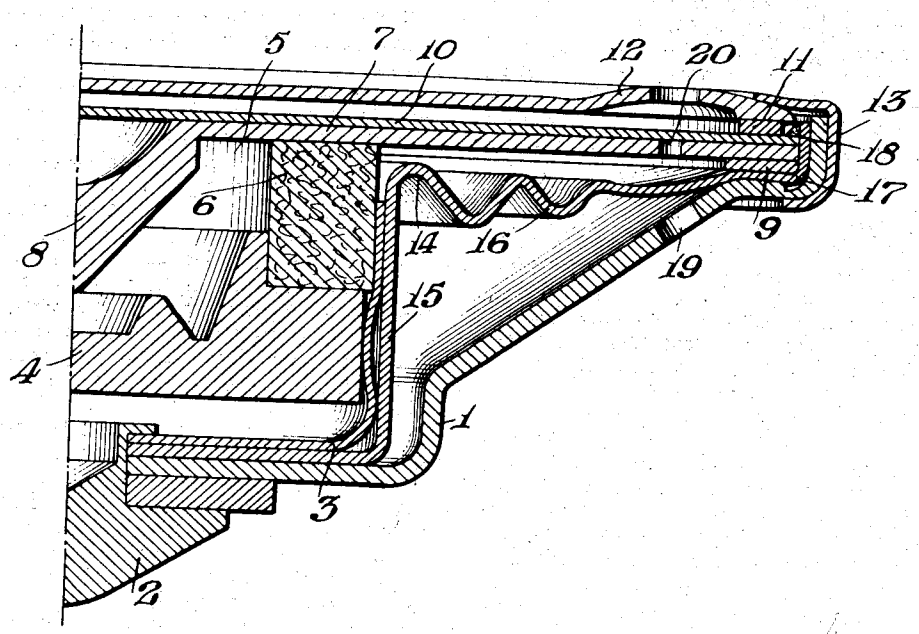


Fig. 2.

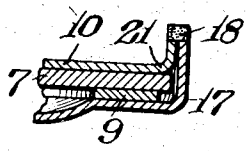
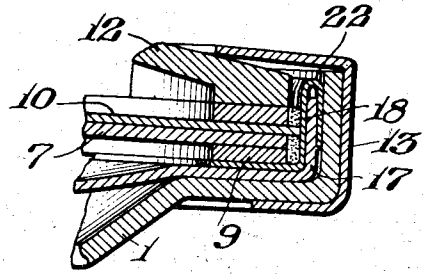


Fig. 3.



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2,345,078

CARBON MICROPHONE

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Application March 24, 1941, Serial No. 384,829
In Germany February 20, 1940

6 Claims. (Cl. 179—122)

This invention relates to a sealed microphone case and has for its object to improve the seal, particularly to reduce the influence of great fluctuations of temperature on the operation of the sealed microphone.

In properly sealed microphone cases the air volume in front or behind the operating diaphragm varies in the case of great fluctuations of temperature in such a manner that the protective diaphragm when in operation for a considerable time expands and comes into contact with the operating diaphragm so that in the case of an intense cooling it experiences together with the latter a deflection. It has already been proposed to reduce this influence by the fact that the air volume is made as small as possible by inserting filling material between the case wall on the one hand and the operating diaphragm and the carbon chamber on the other hand. However, this measure does not fulfil the desired requirements in the case of great fluctuations of temperature. It has also been proposed to minimize the influence of differences in pressure on the operating diaphragm of the microphone by closing the rear part of the microphone case or the carbon chamber by means of a flexible diaphragm, for instance, of rubber which may easily expand upon the occurrence of an inner overpressure and thus brings about a compensation of pressure. However, in the above-mentioned known arrangements an absolute tightness cannot be attained, since the operating diaphragm and its bearing points are not sealed at the side opposite the electrode.

The above-mentioned drawbacks are avoided according to the invention by enclosing the carbon chamber together with the operating diaphragm in a continuous inner protective casing made of a material which is resistant to corrosion, water-tight and preferably not conducting, said protective casing consisting of a protective diaphragm and of a flexible corrugated pressure compensation diaphragm. In this manner the protective diaphragm necessary for a proper tightness is protected against the influence of the fluctuations of pressure occurring inside the microphone, since the pressure compensation diaphragm expands under the influence of an over-pressure easier and quicker than the protective diaphragm. Furthermore, the filling material as well as the insulation between the carbon chamber and the filling material are dispensed with, since a shunt between the operating diaphragm and the casing cannot occur in case the carbon granules should fall out of the carbon chamber. As neither the protective diaphragm nor the operating diaphragm are influenced in an effective manner by the fluctuations of pressure, the protective diaphragm may be spaced from the operating diaphragm any short distance and even come into contact therewith so that the two diaphragms so to say function as a single diaphragm, which is more advantageous from an acoustical point of view, since the air volume which becomes acoustically effective and is to be maintained as small as possible may be reduced to a further extent. As the protective diaphragm and the pressure compensation diaphragm are so designed as to form a continuous protective casing, an absolute tightness is attained which is not the case if the protective diaphragm and the pressure compensating diaphragm are arranged in spaced relation from each other, since the joints between the operating diaphragm and the contact ring, between the protective diaphragm and the operating diaphragm and between the pressure ring and the protective diaphragm must be separately sealed. The manner in which the seal is carried out avoids additional packing rings. The protective diaphragm and the pressure compensation diaphragm are preferably made of the same material, such as, for instance, polyvinyl chloride and glued together. The sealed microphone may be particularly simplified by arranging the pressure compensation diaphragm between the carbon chamber and the microphone wall as close as possible to the operating diaphragm and by bending the edge thereof at right angles by the deep drawing process, the edge being glued with an adhesive substance consisting of the protective casing material to the protective diaphragm 10 contacting with the edge of the operating diaphragm 7 or lying on the latter. By also arranging the pressure compensation diaphragm as close as possible to the operating diaphragm, the air volume whose expansion is to be compensated is reduced to a further extent. The edge bent at right angles facilitates the fastening of the protective diaphragm and the use of an adhesive substance consisting of the material of the protective casing permits a particularly intimate joint between the protective diaphragm and the pressure compensation diaphragm. In order to facilitate the joining of the pressure compensation diaphragm and the protective diaphragm, the latter may also be bent at right angles by the deep drawing process. The electrical connection of the microphone is established in a known manner through a contact nip-

ple and the microphone case insulated from the contact nipple. The connection with the microphone case and the movable electrode may be obtained in a simple manner by the fact that one or more contact foils which are on the one hand soldered to the microphone wall and on the other hand are secured to the contact ring for the operating diaphragm, pass through the protective casing at the joint between the protective diaphragm and the pressure compensating diaphragm. In order to attain a proper expansion of the pressure compensation diaphragm the corrugated portion of the pressure compensation diaphragm may have a smaller thickness than the other portions thereof.

In the accompanying drawing are shown some forms of the invention in diagrammatic form, in which

Fig. 1 shows a sectional view of one half of the sealed microphone case according to the invention.

Fig. 2 is a part sectional view of another form of the invention, and

Fig. 3 shows a part sectional view of the microphone casing of Fig. 1 at the point where the contact foil passes.

Referring to Fig. 1, 1 denotes a truncated cone-like case. Its bottom is provided with an opening in which is arranged a contact nipple 2. A resilient cup 3 in which is arranged the fixed electrode 4 is secured to the case 1 with the aid of the contact nipple 2. The fixed electrode 4 forms a part of the casing for the carbon chamber 5 which is closed at the side, for instance, by means of a felt strip 6 which bears against the operating diaphragm 7 integral with the movable contact 8. The edge of the diaphragm 7, a bearing ring 9, a pressure ring 11 and a cover plate 12 are firmly secured together with a protective diaphragm 10 to the case 1 by means of a flanged ring 13. Between the cup 3 and the case wall 1 as well as between the bearing ring 9 and the wall 1 are clamped the edges of a pressure compensation diaphragm 14 consisting preferably of polyvinyl chloride which is particularly resistant to corrosion and weatherproof and which retains its shape despite its small stiffness. The pressure compensation diaphragm 14 has a central cup-like portion 15 which surrounds the electrode 4 and the resilient cup 3, a corrugated portion 16 as well as an edge 17 bent at right angles by the deep drawing process. The portion 15 and the edge 17 mechanically stressed by the rivet-like contact nipple 2 and the flanged ring 13 are preferably given a relatively large thickness, whereas the portion 16 serving to compensate the pressure has a smaller wall thickness. To maintain the air space behind the operating diaphragm small, the pressure compensation diaphragm 14 is arranged as close as possible to the operating diaphragm 7. The edge 17 of the pressure compensation diaphragm 14, bent at right angles engages all joints of the parts lying one upon the other and is glued to the edge of the auxiliary diaphragm 10 as indicated at 18. To this end, an adhesive substance is preferably employed, consisting of the material of which the pressure compensation diaphragm and the protective diaphragm 10 are made. The parts 10 and 14 forming the inner protective casing are preferably made of the same material. The protective diaphragm 10 may lie directly on the operating diaphragm 7 so that the air space between the protective diaphragm 10 and the operating diaphragm 7 is practically eliminated, which is favorable from an acoustical point of view. This may be accomplished by the fact that any fluctuation of pressure is easily compensated for as a result of the expansion of the corrugated portion 16 of the pressure compensation diaphragm 14. In this case the stiffness of the pressure-compensation diaphragm must be small as compared with the stiffness of the protective diaphragm and the operating diaphragm. Any water of condensation formed between the case 1 and the pressure compensation diaphragm 14 is discharged through openings 19 in the case wall 1. The air between the operating diaphragm 7 and the pressure compensating diaphragm 14 acts on the auxiliary diaphragm 10 through an opening 20 arranged in the operating diaphragm 7. To easily secure the pressure compensation diaphragm 14 to the protective diaphragm 10, the latter may be provided as will be seen from Fig. 2 with an edge 21 bent at right angles by the deep drawing process which is glued to the edge 17 of the pressure compensating diaphragm 14 also bent at right angles. The electric connection is established on the one hand through the contact piece 2, the elastic cup 3 to the electrode 4 and on the other hand through the wall 1 through one or more contact foils 22, the bearing ring 9 to the operating diaphragm 7. The wall 1 is insulated from the electrode 4 and the contact foils are glued to the wall 1 as indicated at 18 and clamped at one end thereof between the bearing ring 9 and the pressure compensation diaphragm 14. The adhesive substance 18 as will be seen from Fig. 3 may be applied to both sides of the protective diaphragm 10 so that at the point where the contact foil 22 passes a proper sealing may be attained. The wall thickness of the portion 15 of the pressure compensation diaphragm 14 may be so chosen that it may serve as the wall for the carbon chamber. As will be apparent from Fig. 3 a simple and effective seal is attained which has no detrimental influence on the acoustical properties of the microphone even in the case of fluctuations of temperature. Particular filling bodies and sealing rings are avoided.

What is claimed is:

1. In a microphone, a fixed electrode, a movable electrode, a diaphragm secured to said movable electrode for operating the same, a protective casing for said parts comprising a protective diaphragm in front of said operating diaphragm and a flexible pressure compensating diaphragm in the rear thereof, said compensating diaphragm having a peripheral portion which extends past the edge of said operating diaphragm and is sealed to the edge of said protective diaphragm, and an outer casing surrounding said protective casing.

2. In a microphone, a generally cup-shaped casing having a central opening for a terminal, a corrugated diaphragm having a central cup-shaped portion sealed to said casing around said opening, an operating diaphragm in front of said corrugated diaphragm and spaced away therefrom, a protective diaphragm in front of said operating diaphragm and in contact therewith, said corrugated diaphragm having a peripheral portion which is sealed to the edge of said protective diaphragm, means for periph-

erally clamping all said diaphragms in said casing, and fixed and movable electrodes in the cup-shaped portion of said corrugated diaphragm.

3. A microphone as claimed in claim 1, wherein the protective diaphragm and the compensating diaphragm are made of a synthetic resinous compound.

4. A microphone as claimed in claim 1, wherein the protective diaphragm and the compensating diaphragm are made of poly-vinyl chloride.

5. A microphone as claimed in claim 1, wherein the electrical connection to the movable electrode includes a strip of metal foil which passes through the protective casing at a point where the compensating diaphragm and protective diaphragm are sealed together.

6. A microphone as claimed in claim 2, wherein the central cup-shaped portion of the corrugated diaphragm has a greater wall thickness than the remaining portion thereof.

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