Dec. 14, 1937. A. HAMMER 2,102,150

DIAPHRAGM

Filed Dec. 26, 1935

Fig. 1

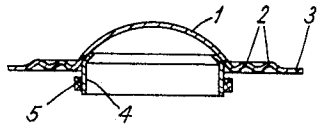


Fig. 2

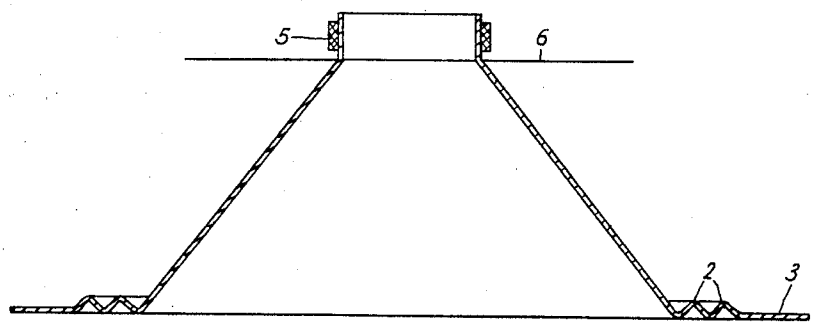
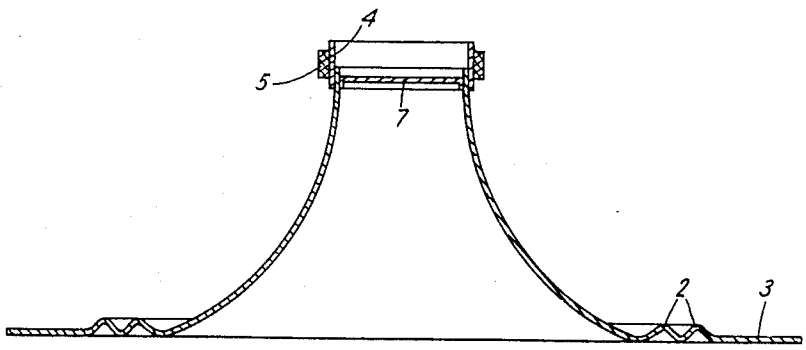


Fig. 3



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Patented Dec. 14, 1937

2,102,150

UNITED STATES PATENT OFFICE

2,102,150

DIAPHRAGM

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Application December 26, 1935, Serial No. 56,140
In Germany November 6, 1934

4 Claims. (Cl. 181—32)

The invention relates to diaphragms of hygroscopic work material such as fibrous material (paper, card board) or similar work material for acoustic apparatus, especially loudspeakers.

The diaphragms produced of hygroscopic work materials such as fibrous materials (paper) or similar work materials and composed of individual parts in the ordinary manner, or produced in accordance with the casting or moulding method, have the disadvantage that they are capable of absorbing from the air a comparatively large amount of water. At varying humidity of the air there also varies the moisture content of the diaphragm. Under these influences the diaphragm is continuously subjected to variations and buckles whereby the initial shape of the diaphragm will no longer be retained. Due to the deformations of the diaphragm the reproduction of loudspeakers in which such diaphragms are mounted, is considerably disturbed since the parts connected with the diaphragm such as mount and drive are moved out of their initial position. Thus in dynamic loudspeakers for instance, the oscillatory or voice coil may be placed against the poles of the magnet system and gives cause to microphonic effects. Also considerably non-linear distortions may occur during the reproduction.

It has been proposed to avoid the deformations of diaphragms due to the varying amount of humidity, to cover the finished diaphragms with lacquer. Generally, artificial lacquers, or lacquers of natural resin are used, and which after being applied to the diaphragms, are ordinarily subjected to a heat treatment. Since these lacquers however begin to crack in time, water enters the very fine cracks and penetrates in considerable amount into the material of the diaphragm due to capillary action. In view of the high absorption of water the diaphragm material performs such inner action, that a proper operation with diaphragms treated in such manner is not possible.

Due to the treatment of the surface of the diaphragm with the known lacquers, the acoustic performance of the diaphragms will be very greatly varied. The lacquers become very hard in the course of time, thus considerably solidifying the surface layers of the diaphragm. Furthermore, also the individual fibers on the surface of the diaphragm will be highly hardened. As a result thereof the inner damping of the actual diaphragm material will be highly reduced since the individual parts of the fibers can no longer displace themselves relative to each other. This condition produces an essential increase in the formation of distinct partial oscillations of the diaphragm whereby the reproduction is detrimentally affected.

In accordance with the invention the absorption of humidity by the diaphragms will be avoided by treating the diaphragms wholly or partially by means opposing water or insoluble in water. Among these means may be mentioned for instance water soluble vinaigrous potters clay, furthermore, albuminous solutions which are subsequently hardened by means of chromates or bi-chromates or the like. The treatment can be carried out in such manner that the mentioned means are applied or sprayed on the finished diaphragm in a liquid state, or the diaphragms are totally or partially impregnated therewith. It is also possible to add the solutions simultaneously to the diaphragm material to be worked when producing the diaphragm.

As already stated above it will thereby be accomplished that absorption of moisture from the air by the diaphragm is practically completely avoided. It is thus no longer possible that the diaphragms continue to act under the influence of the varying moisture content of the air, in other words, they will no longer buckle, but retain the shapes in which they were originally formed.

In treating the diaphragm with the mentioned means the desired increase in the mechanical strength of the diaphragm is obtained, yet the characteristic properties of the work material or of the individual fibers are retained, i. e. the inner damping of the diaphragm is practically not at all decreased or only to an unessential degree relative the inner damping of a non-treated diaphragm so that partial oscillations at reproduction will no longer be noticed in a disturbing manner. These means have the advantage over the usually employed lacquers that they enter into the structure of the diaphragm and into their fibers without changing the structure of the diaphragm so that the movability of the individual fibers of the work material of the diaphragm will be changed only to an unessential degree relative to the condition of the non-treated diaphragms.

Figures 1, 2, and 3 of the drawing show various examples of embodiments of diaphragms for electro-dynamic systems preferably produced according to the casting or moulding method. The diaphragms may, however, also be composed of individual parts connected with each other.

In place of the electro-dynamic drive system, obviously, also an electro-magnetic system, that is, one provided with a moving armature, or any other drive system may be employed. Corresponding parts are provided in the figures with corresponding reference characters.

Figure 1 shows an example of an embodiment of a diaphragm used for dynamically driven cone systems. The cup-shaped diaphragm 1 ends into corrugations 2 terminating into an upper rim 3. There is fastened to the diaphragm 1, the coil body 4 which carries the voice coil winding 5. The surface of the diaphragm 1 and the mount consisting of the corrugations 2, as well as the diaphragm rim 3 are totally or partially treated with the means opposing moisture above described.

Figure 2 shows an example of an embodiment of freely radiating cone diaphragm for dynamic loudspeakers. In this example a special alignment spiral 6 forms an exterior centralizing means.

Figure 3 is a further example of an embodiment of a diaphragm having a complex shape and in which in place of an exterior centralizing means for the oscillatory coil an inner centralizing means 7 is chosen.

What I claim is:

1. A diaphragm for acoustic devices made from mouldable fibrous material which has been treated with an albuminous solution.

2. A diaphragm for acoustic devices made from mouldable fibrous material which has been treated with an albuminous solution containing chromates.

3. A diaphragm for acoustic devices made from mouldable fibrous material which is impregnated with an albuminous solution containing chromates.

4. A diaphragm for acoustic devices made from mouldable fibrous material and coated with an albuminous solution containing chromates.

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