Jan. 16, 1934. G. R. EATON 1,943,425

DIAPHRAGM

Filed Dec. 26, 1931

Fig. 1.

Fig. 2.

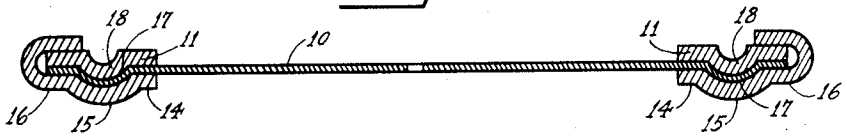


Fig. 3.

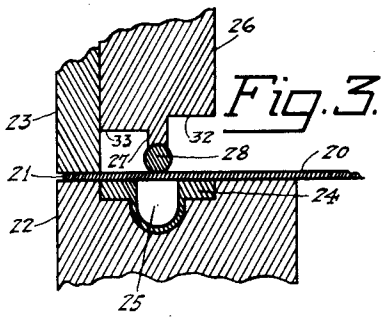


Fig. 4.

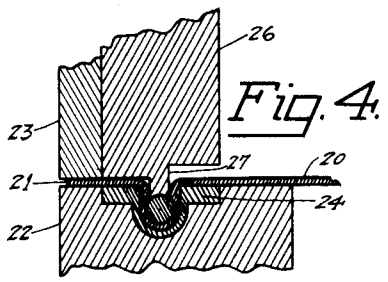


Fig. 5.

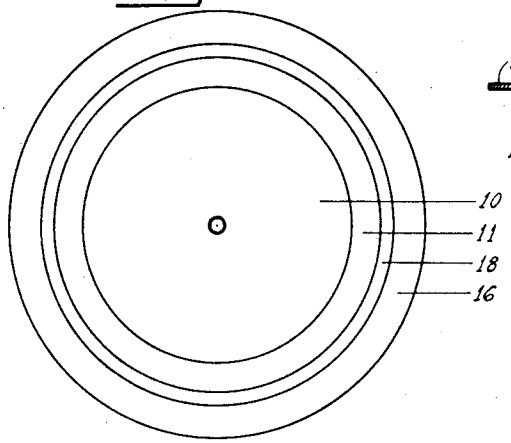
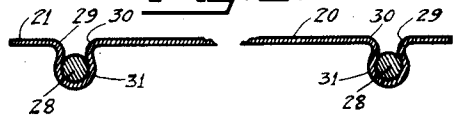


Fig. 6.



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Patented Jan. 16, 1934 1,943,425

UNITED STATES PATENT OFFICE

1,943,425

DIAPHRAGM

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Application December 26, 1931. Serial No. 583,300

10 Claims. (Cl. 181—31)

This invention relates to acoustic apparatus in general and particularly to telephone transmitters in which sound vibrations are brought into contact with a diaphragm and the resulting vibrations of the diaphragm are utilized to cause relative movement between two members forming part of a current controlling device. This relative movement of the current controlling device varies the amount of current flow in the associated circuit.

A diaphragm of this character has a natural vibration period which is usually within the range of the frequencies of the voice. This condition results in a distortion of the speech waves impressed upon the diaphragm when the resonance point of the diaphragm falls within the range of the speaking frequencies. It has been found that increasing the stiffness of the diaphragm by stretching the same increases its natural vibration frequency to a point above those frequencies used in transmitting speech and overcomes the detrimental effect otherwise present.

An object of my invention is to provide an efficient and economical method and means for tensioning diaphragms of acoustic devices.

A feature of my invention is the stretching of the diaphragm before the same is placed in the receiver shell and the maintenance of it in its stretched condition until such time as its use becomes desirable.

This invention can be more readily understood by reference to the following specification and claims in connection with the accompanying drawing in which:

Fig. 1 is a cross-sectional view of a diaphragm preparatory to the stretching operation;

Fig. 2 is a cross-sectional view of a completed stretched diaphragm;

Fig. 3 is a cross-sectional view of the means used in another method of stretching a diaphragm;

Fig. 4 shows the means disclosed in Fig. 3 in their operated position;

Fig. 5 is a plan view of a completed diaphragm; and

Fig. 6 is a cross-sectional view of a diaphragm formed by the method disclosed in Figs. 3 and 4.

Fig. 1 shows the diaphragm 10 which may be formed of any suitable material before the stretching operation has been performed. An annular member 11 is provided and so placed upon the diaphragm 10 that its peripheral edge 12 is substantially flush with the peripheral edge of the diaphragm 10. A second annular ring 14 is provided with a grooved portion 15 and an extending portion 16 and placed under the diaphragm 10 so its inner edge is substantially flush with the inner edge of the annular ring 11.

The assembled pieces are placed in a machine which clamps them in their proper positions and then pressure is exerted upon the diaphragm 10 and the member 11 and they are forced into the groove 15 in the member 14 and grooves 17 and 18 are formed in the diaphragm 10 and member 11. As the outer edge of the diaphragm 10 is clamped securely the material which forms the groove 17 is taken from the center portion of the diaphragm 11 and this results in the stretching of the diaphragm 10.

The extending portion 16 of the annular member 14 is next turned over the outer peripheral edges of the diaphragm 10 and annular member 11. This operation serves to clamp the ring members and diaphragm 10 together and maintain the same as a unit structure.

An alternative method of stretching a circular diaphragm is illustrated in Figs. 3, 4 and 6 in which the diaphragm 20 has its outer peripheral edge 21 securely held between a pair of circular clamping members 22 and 23. A circular die member 24 having a groove 25 is fastened in the clamping member 22 in such a position that the diaphragm 20 rests upon the extending portions of the die member 24.

A press 26 which is also circular in shape is provided with a depending lug 27 which is positioned directly above the groove 25. Secured to the lug 27 in any suitable manner is a strengthening member which may take the form of a wire 28 which is of circular cross-section and also circular in shape. When the press 26 is operated the lug 27 is forced downwardly and the wire 28 pushes the diaphragm 20 into the groove 25. As the outer peripheral edge 21 of the diaphragm 20 is securely clamped between the members 22 and 23 the material which enters the groove 25 comes from the center of the diaphragm 20 which results in the stretching of the diaphragm. As the wire 28 enters the enlarged portion of the groove 25 the diaphragm 20 closes in back of it and forms the shoulders 29 and 30. Consequently when the press 26 is raised and the diaphragm is removed from the member 24 the wire 28 is maintained within the loop 31 formed in the diaphragm 20. The wire 28 maintains the diaphragm 20 in its stretched condition and also serves to strengthen the edge of the diaphragm. The lower face 32 of the press 26 is slightly higher than the face 33 so that the diaphragm 20 will not be injured when the press 26 is operated.

Obviously the invention is susceptible of embodiment in forms other than that which is illustrated in the accompanying drawing and I therefore desire that it be understod that modifications and alterations may be made and that I intend no limitations upon my invention other than those imposed by the scope of the appended claims.

Having described my invention, what I claim is new and desire to secure by United States Letters Patent is:

1. The method of manufacturing a stretched diaphragm which consists in clamping the peripheral edge of the diaphragm between a pair of annular members one of which has a groove therein and then forcing a portion of the diaphragm and of the other annular member into said groove to form a unitary structure.

2. The method of stretching a diaphragm which consists in clamping the peripheral edge of the diaphragm between a pair of annular members one of which has a groove and an extending portion, forcing a portion of said diaphragm and said other annular member into said groove and then folding said extending portion over the outer peripheral edge of said diaphragm and said annular member.

3. The method of manufacturing a stretched diaphragm which consists in clamping the peripheral edge of said diaphragm between an annular member having a groove therein and a substantially annular strengthening member, forcing a portion of said diaphragm into the groove of said annular member to form a groove in said diaphragm near its peripheral edge, and turning a portion of the edge of one of said members over the edge of said diaphragm and said other member to form a unitary structure.

4. The method of stretching a diaphragm which consists in clamping the peripheral edge of said diaphragm in a device having a grooved member secured therein, then forcing a portion of said diaphragm and a strengthening member into said grooved member whereby said diaphragm is stretched and the strengthening member is maintained in a groove in said diaphragm.

5. The method of putting a diaphragm under tension which consists of clamping the outer peripheral edge of the diaphragm, forming a bead in said diaphragm within the clamped portion and securing a relatively rigid annular member within said bead.

6. The method of putting a diaphragm under tension which consists of clamping the outer peripheral edge of the diaphragm, forming a substantially circular bead in said diaphragm within the clamped portion and securing a relatively rigid annular member within said bead.

7. A diaphragm, a bead formed in said diaphragm adjacent to the circumference thereof, and a substantially annular strengthening member secured in said bead.

8. A substantially circular diaphragm, a bead formed in said diaphragm adjacent to the circumference thereof and a substantially annular strengthening member secured in the said bead.

9. A pair of annular members, a diaphragm, the peripheral edge of said diaphragm being securely clamped between said annular members, a groove in one of said members, a portion of said diaphragm and of said other annular member fitting in said groove, and means for securing said annular members and the periphery of said diaphragm in firm engagement.

10. A diaphragm, a pair of annular members, a groove in one of said members, a portion of said diaphragm and of said other annular member fitting in said groove, and a portion of one of said annular members folded over the peripheral edge of the diaphragm and of the other annular member.

GEORGE R. EATON.