Feb. 7, 1933. O. B. HANSON 1,896,844

ACOUSTICS

Filed Jan. 28, 1931

Fig. 4

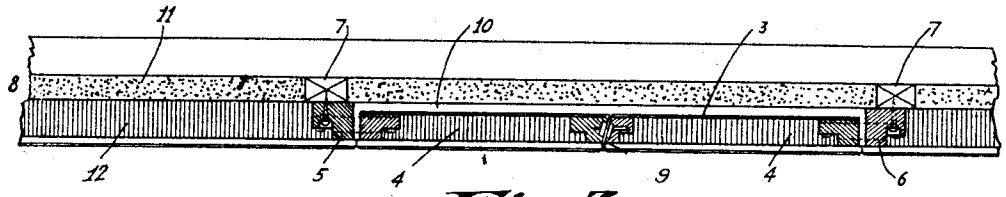


Fig. 3

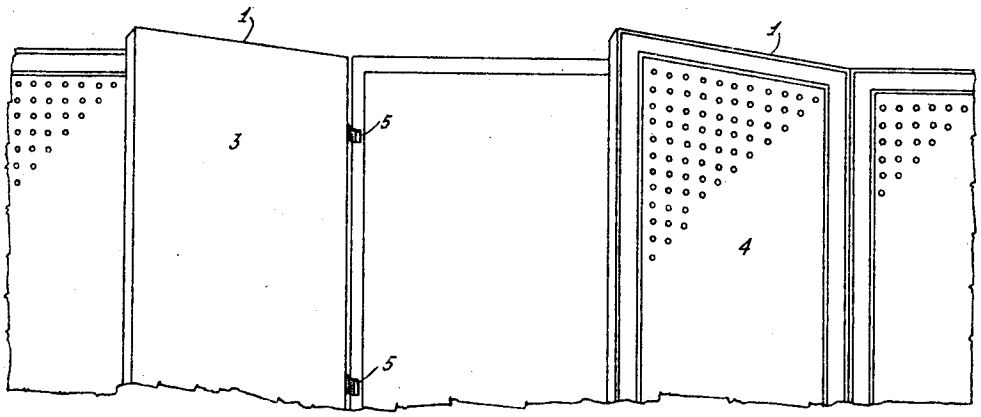
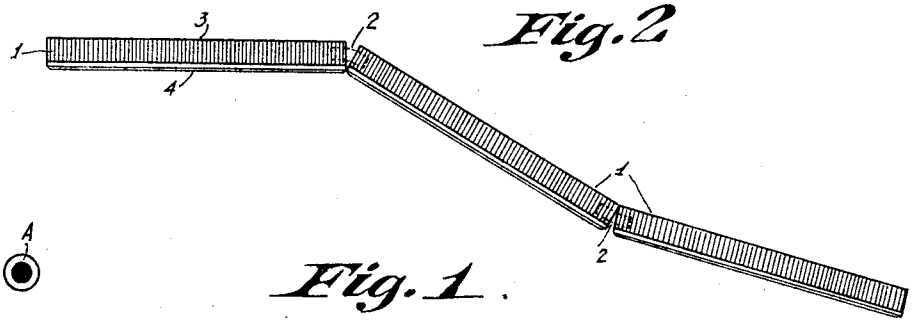
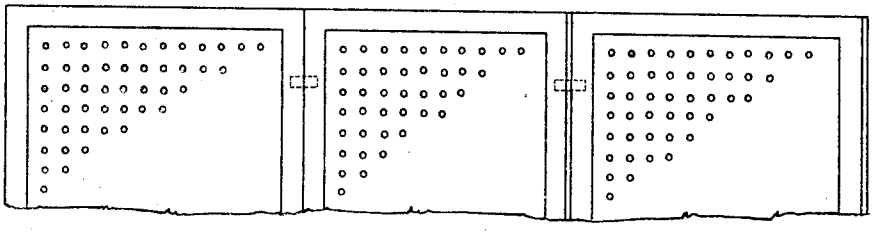


Fig. 2



A

Fig. 1.



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UNITED STATES PATENT OFFICE

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ACOUSTICS

Application filed January 28, 1931. Serial No. 511,772.

This invention relates to the science of acoustics and has as its object an improved means of preparing walls, ceilings, movable folding screens, or panels to be used in rooms or buildings wherein sound is originated or reproduced. This is for the purpose of providing acoustical regulation and consists of certain improvements in acoustic elements whereby a variable absorption effect may be obtained.

An object of the invention is to provide a novel acoustic element which may be installed in any position relative to transmitting microphones or other electrical sound transducing apparatus in such a manner as to insure the desired results insofar as they may be obtained by acoustical regulation or by varying the disposition of the acoustic element to obtain the most pleasing sound reproduction.

This object is obtained by the use of an acoustical element, the sound absorption characteristic of which is adjustable in a simple and convenient manner.

In one form of the invention the variable acoustical element consists of folding panels or elements, the surfaces of which have different sound absorption characteristics. The panels are inset in recesses in a wall and hinged at one end thereto so that they may be swung on their hinges to the desired position with respect to the wall so that sound directed towards the wall will either strike the surface of the wall or the acoustically treated surface of the hinged element. Obviously, the sound absorption characteristics of the wall and of the room may be varied between two extremes. When the hinged panels are closed they present an apparently unbroken acoustically treated surface thereby absorbing a considerable amount of the sound wave reaching the wall in which the element is inset. When the panels are partly opened the surface of the wall back of the panels is exposed to the sound waves. This surface may be made up of hard sound reflecting material having very low or negligible absorption characteristics. When the panels are open to their fullest extent the rear surface of the panel, as well as the hard plaster surface of the wall back of the panel, is exposed to the sound waves thereby presenting a reflecting surface of double the area of the acoustic surface on the front side of the variable elements. Obviously the elements may be swung into any position to obtain acoustical characteristics for the room which is a mean between the two extremes. Any number of these acoustical elements may be placed in walls of the room or the studio to provide the necessary acoustical adjustment. The acoustical elements may be placed in the floors and/or ceilings of the room as well as in the walls. Furthermore, the acoustical elements may be hinged to fold into recesses in the walls, ceilings or floors or may be adapted to extend the required amount from slots therein or to be carried on rollers set in the wall or ceiling or floor and adapted to be unrolled the required amount.

In another modification of the invention the variable accoustical elements may comprise movable folding screens, one surface of which is hard and sound reflecting while the other surface may be accoustically treated to absorb sound waves to the desired extent. These screens may be placed around the studio in the desired position with respect to the sound producing or reproducing instruments and with respect to the performers and musicians who are providing the performance.

An apparent advantage of the present invention is that the acoustic characteristics of the studio or room in which the sound is being produced may be varied between wide latitudes to offset any undesirable acoustic characteristics therein due to absorption caused by the presence of performers or audience.

A better understanding of the invention will be had from the following detailed description thereby and therefrom when read in connection with the attached drawing in which:

Figures 1 and 2 show an acoustical element in the form of a movable folding screen, the opposite surfaces of the panels of which are treated in accordance with the present invention while;

Figures 3 and 4 show a preferred form of the invention in which the panels, the opposite surfaces of which are treated in accordance with the present invention, are hinged in insets in the walls and adapted to be swung into the open position or into the closed position.

Referring to the drawing, and in particular to the modification shown in Figures 1 and 2 thereof, the adjustable acoustic element includes panels as indicated at 1, which are hinged together as shown at 2 to provide a folding screen which may be moved around the room and which may be positioned in any manner to present the desired amount of either side of the screen to the sound reproducing apparatus A and the performers adjacent thereto. The surface 3 of the panels is composed of hard smooth material adapted to reflect sound waves while the surface 4 of the panel is composed of acoustical material having the desired sound absorbing qualities, so that the surface 4 thereof when presented to the source of sound, will absorb the sound waves rather than reflect them. While the panels 1 have been shown as being composed of material having acoustical treatment it will be understood that the panels may be composed of any other material with the acoustical treatment applied to one surface and the hard material applied to the other surface.

In Figures 3 and 4 the acoustical element comprises elements or panels 1 hinged as shown at 5 and 6 to a support 7 of the wall 8. The free ends of the panels are arranged as shown to overlap as at 9 so that when they are in the closed position in the inset 10 in the wall 8 they present to the sound waves an acoustically treated surface. Means is provided, as indicated, to retain the members 4 in the closed position. The wall 8 is built up, as indicated, of a hard plaster layer 11 and a layer of acoustic treatment 12. The surface of the hard plaster 11 is exposed to the sound waves when the acoustical elements 1 are in the open position so that the sound waves are reflected thereby when the elements 1 are swung out from the wall in the open position. In the closed position of the elements the entire wall presents an acoustically treated surface since the walls are acoustically treated with "Acousti-Celotex" or "Acoustone" and the surfaces 4 of the panels are acoustically treated. When the panels are swung in the extreme open position, the hard reflecting surface 3 of the panels, as well as the hard reflecting surface 11 of the wall back of the panel, is exposed to the sound wave. The panels may be swung into any position between the extremes to obtain the desired acoustical characteristics for the wall or room.

While it is understood that the reflecting surfaces of the walls and of the hard surfaces of the panels may be composed of any hard reflecting material, it has been found that good results may be obtained by covering these surfaces of the walls and of the variable acoustical elements with hard plaster, sheet iron or steel. The sound absorbing surfaces 12 of the walls or panels 4 may be covered by acoustical hair felt or any other sound absorbing material as, for instance, "Acousti-Celotex" or Acoustone tile. Of course the panels or walls themselves, or portions thereof, may be composed of sound absorbing material. The surface of the wall back of the panels in the modification shown in Figure 2 may be of hard plaster or any other hard material as, for instance, metal which has considerable sound reflecting qualities.

Having now described my invention and the object thereof in detail, what I claim as novel is:

1. A variable acoustic element comprising a movable folding screen having a plurality of hinged members, the opposite surfaces of which have different acoustical characteristics.

2. A variable acoustic element to be used in a room in which sound is produced or reproduced including panels hinged to a wall of said room and adapted to swing into a recess in said wall, the normally closed surfaces of said panels having different acoustical characteristics than the normally open surface.

3. A variable acoustical element to be used where sound is originated or reproduced comprising a panel, one surface of which is of hard plaster and the other surface of which is made of "Acousti-Celotex".

4. A variable acoustical element to be used in connection with origination of reproduction of sound from a source of sound comprising a plurality of hinged panels located within the chamber where the said sound originates and said panels being hinged to swing in inserts on the wall of said chamber, the surfaces of each panel having different sound absorbing characteristics and means for exposing a variable amount of the surfaces of said panels to said sound source.

5. A variable acoustic element to be used in a chamber in which sound is produced or reproduced including a panel hinged and arranged to swing into a recess in the inner surface of the chamber, the opposite surfaces of said panel having different acoustical characteristics.

6. A variable acoustical element to be used where sound is originated or reproduced, comprising a movable folding screen having three panels hinged together, one surface of said panels having sound reflecting material, the other surface having sound absorbing material.

7. A variable acoustic element to be used in a room where sound is produced and repro-

duced, comprising a pair of acoustically treated panels hinged to the wall of said room, one surface of said panels having sound reflecting material, the other surface having sound absorbing material and the free ends arranged to overlap when in the closed position so as to present an acoustically treated surface.

OSCAR B. HANSON.