Our present invention relates to acoustic apparatus, and more particularly to a cabinet which will enhance the sound reproducing qualities of sound translating apparatus mounted therein. With the advent of improved phonograph records, FM broadcasting and television sound, it is desirable to improve the quality of sound reproduction and overall fidelity of apparatus offered to the public. In many cases, apparatus of this kind employs a loudspeaker mounted behind an opening in a vertical front wall of a console type cabinet, the loudspeaker also being disposed adjacent to the bottom of the cabinets. Many cabinets of this type are provided with doors or panels for closing the front wall opening during periods when the instrument is not in use. From the standpoint of response, cabinets of this type have been found not only to have a very narrow directivity pattern in the high frequency range which results in frequency discrimination for points removed from the axis of the loudspeaker, but also a deleterious effect upon the response frequency characteristic resulting from operation of the loudspeaker or sound translating mechanism behind an anti-resonance cavity. The anti-resonance cavity in many cabinets is quite deep, particularly those cabinets which are equipped with doors or sliding panels for closing the opening in the front wall. In some cabinets, the depth of the cavity introduced by reason of the combined thicknesses of the open doors, the front wall of the cabinet, the decorative grill and the baffle board on which the loudspeaker is mounted is as much as three inches. A reduction in depth of such an anti-resonance cavity would, therefore, be desirable since it would reduce the effects of nonuniform response.

The primary object of our present invention is to provide a cabinet for sound translating apparatus which will result in an improved frequency response characteristic for the sound translating apparatus mounted therein.

Another object of our present invention is to provide an improved mounting for a loudspeaker disposed in a cabinet which will enhance the sound reproducing qualities of the loudspeaker.

It is also an object of our present invention to eliminate anti-resonance effects of conventional console cabinets in which loudspeakers of the direct acting type are employed.

It is a further object of our present invention to provide a cabinet for sound translating apparatus which will result in an improved directivity pattern in the high frequency response range.

In accordance with our present invention, we provide an adjustable sound board for a console type cabinet having a front wall provided with an opening and a removable closure for the opening. The sound board is mounted in the cabinet for slidable movement from an inact position to an active position with the board being located on the front wall opening and flush with the removable closure when the latter is withdrawn from the opening. The apparatus is arranged so that, upon opening of the removable closure, the sound board will be moved simultaneously into its active position. The sound board is also arranged to accommodate mounting of a loudspeaker thereon, with the loudspeaker diaphragm extending through an opening in the sound board and having the periphery thereof mounted substantially flush with the front surface of the sound board. Thus, when the apparatus is in its active position within the front wall opening, it will substantially eliminate any cavity in front of the loudspeaker. In addition thereto, the cabinet front wall and the loudspeaker mechanism including the sound board are disposed at an angle with respect to the floor so as to make it possible to realize the full value of a broader directivity pattern which the apparatus provides in the high frequency response range.

The novel features of our present invention, as well as additional features and advantages thereof, will be understood better from the following detailed description of a single embodiment thereof when read in connection with the accompanying drawings, in which,

Figure 1 is a side view, partly in section, of a console type cabinet in accordance with our present invention, with the doors thereof in a closed position.

Figure 2 is a view similar to Figure 1 but with the doors in an open position.

Figure 3 is an enlarged, sectional view of a portion of the sound board shown in Figure 1.

Figure 4 is an enlarged, fragmentary, sectional view taken on the line 4—4 of Figure 2.

Figure 5 is a fragmentary, enlarged view, in section, of a portion of the slidable supporting structure shown in Figure 4, taken on the line 5—5 of Figure 4.

Figure 6 is an enlarged, fragmentary, sectional view, taken on the line 6—6 of Figure 1.

Figure 7 is a plan view, partly in section, of a portion of a console cabinet corresponding to Figure 6 and showing a loudspeaker supported therein in conventional manner.

Figure 8 is a perspective view of the cabinet as shown in Figure 2.

Figure 9 is a perspective view of the cabinet as shown in Figure 1.
Figure 10 is a diagrammatic, perspective view illustrating a conventional loudspeaker cabinet located in a room and showing the directional pattern thereof.

Figure 11 is a view, similar to Figure 10 but showing a loudspeaker cabinet in accordance with our present invention and the improved directional pattern thereof.

Figure 12 is a curve showing a typical frequency response characteristic of a loudspeaker operating in a conventional cabinet, and Figure 13 is a curve showing the frequency response characteristic of a loudspeaker operating in a console type cabinet in accordance with our invention.

Referring more particularly to the drawings, wherein similar reference characters designate corresponding parts throughout. There is shown a console type cabinet 1 which is arranged to house the usual radio receiver, television receiver, or phonograph components 5, the latter being illustrated in broken line outline in Figures 1 and 2 and shown disposed in the upper portion of the cabinet. The cabinet 1 has a front wall 5 comprising upper and lower vertical portions 4, 6 and an intermediate portion 8. The upper portion 4 is set back from the lower vertical portion 6 so as to define the exterior surface of the intermediate portion 8 to face upwardly and at an angle with respect to the vertical portions 4, 6.

The intermediate portion 8 is also provided with an opening 7. A pair of doors 9 are attached to the front wall 5 by hinges 10 and are of a size to fit within the front wall opening 7 to provide a removable closure for the opening when the instrument is not in use.

A supporting structure 11 for a sound translating device, such as a loudspeaker 13 of the direct acting type, is mounted within the cabinet 1 behind the front wall opening 7. The supporting structure 11 comprises a baffle board or sound board 15 mounted for movement from a concealed, rest or inactive position wholly within the cabinet 1, as shown in Figures 1 and 6, to an active or operative position within the front wall opening 7, as shown in Figures 2 and 4. While any suitable structure may be provided for moving the baffle board 15 between active and rest positions, the embodiment of our present invention, as illustrated herein, employs a slideable arrangement in which the baffle board 15 is mounted on an end 17 of a base or platform 19. The platform 19 is slideable on top of a pair of supports 21 disposed under opposite side portions of the platform. The supports 21 are securely fastened to the cabinet 1 by any suitable means, as, for example, by means of the bolts 22. For the purpose of guiding the platform 19 and the sound board 15 and preventing displacement thereof from its mounted position within the cabinet 1, a guide 25 is mounted on top of each of the supports 21 to form, with the supports 21, a pair of channels 27 within which the platform 19 is disposed for slideable movement.

The sound board 15 is provided with an opening 29 of a size to accommodate mounting any suitable loudspeaker 13 thereon. The loudspeaker includes a direct acting diaphragm 31 which has the base periphery thereof mounted substantially flush with the front surface 33 of the sound board, with the loudspeaker dishpan support 35 and the remainder of the diaphragm extending back through the opening 29. A suitable grill cloth 37 is mounted in front of the opening 29, being held in place by any suitable means, such, for example, as a thin metal framed 39 which is secured to the sound board by screws 41 around the periphery of the grill cloth. A suitable brace 43 of T-shaped cross section is provided between the top portion 45 of the sound board 15 and the platform 19, thereby to rigidly support the sound board on the platform. A pin 47 is secured on each opposite side portion of the platform 19 and extends through a slot 49 provided in each of the guides 25. The function of the pins 47 and slots 49 is to provide stops for limiting outward movement of the sound board 15 and platform 19.

The sound board 15 is of a size to fit within and substantially fill the cabinet front wall opening 7. A pair of coil springs 50 are connected between the cabinet front wall 5 and the platform 19. The springs are under tension to urge the sound board into the front wall opening 7 upon withdrawal of the doors 9 for the opening. The stops provided by the pins 47 and slots 49 are arranged to limit movement of the sound board 15 through the front wall opening 7 so that, in its active or operative position, the sound board will be disposed substantially flush with the doors which are disposed on either side thereof in their operational position, as shown in Figures 2, 4 and 8, and will form a continuous surface with the front wall portions 4 and 6, as best seen in Figure 3.

The edge 51 of each door 9 which is adjacent to the hinges 10, and the proximate edges 53 of the sound board 15 are rounded in the manner shown particularly in Figure 4 of the drawings. The adjacent sides of the doors and the sound board cooperate to effect movement of the sound board 15 to active and inactive positions simultaneously upon opening and closing of the doors 9.

In contrast with a cabinet 55 of conventional type as shown in Figure 7, it will be recognized that our present invention eliminates the customary cavity 57 in front of the loudspeaker 13, which results from the combined thicknesses of the cabinet doors 69, the cabinet front wall 61, the grill structure 53, and the baffle board 65. As a result, for practical purposes, all difficulties of nonuniform response due to such cavities 57 may be said to be entirely eliminated, as shown by a comparison of the frequency response characteristic curves 67, 69 shown in Figures 12 and 13 for the same loudspeaker structure mounted in a conventional cabinet and a cabinet in accordance with our present invention, respectively. It will be seen that the response curve 67 in Figure 12 shows that the response from 1000 to 2000 cycles per second is depressed a maximum of approximately 9 db, whereas the curve 69 in Figure 13 shows the response in that same range of frequencies to be depressed a maximum of only 2½ db.

As an additional expedient to improving response in the high frequency range, the intermediate portion 8 of the cabinet front wall 5 and the loudspeaker 13 are inclined. In conventional cabinets, the loudspeaker is mounted near the bottom of the cabinet 71 and in back of an opening 73 provided in a vertical front wall 75, as shown in Figure 10 of the drawings. This type of mounting results in a reduction in "presence." (The term "presence," as used herein, is a psychological term to describe a type of intimacy in live and reproduced sound.) "Presence" is found to be decreased as the loudspeaker is moved downward in the cabinet from a position at ear
level to one near the floor. By inclining a loudspeaker disposed near the bottom of a cabinet in the manner shown in Figures 1, 2, 6 and 11, "presence" can be regained, since it makes possible to realize the full value of a broader directivity pattern in the high frequency range, as shown by the directivity patterns 77, 79 in Figures 10 and 11. The total angular coverage for a variation of ±8° for the region between 2000 and 5000 cycles per second is depicted in Figure 11 as 90 degrees for the loudspeaker and cabinet, in accordance with our present invention, as compared to 40 degrees for the conventional cabinet and loudspeaker.

From the foregoing description, it will be recognized by those persons skilled in the art that the cabinet with mounting structure for sound translating apparatus in accordance with our present invention provides an improvement in performance because of smoother response, broader directivity pattern and improved "presence." Although we have shown and described but a single embodiment of our present invention, it is obvious to those persons skilled in the art that modifications and changes are possible within the spirit of our invention. For example, instead of mounting the loudspeaker behind the front wall 5 of a cabinet, it may be mounted behind a suitable wall or partition in a room or the like. Other changes of like nature are possible. Therefore, we desire that the particular form of our invention described herein shall be considered as illustrative and not as limiting.

What is claimed is:
1. In a cabinet for sound translating apparatus, said cabinet having a front wall provided with an opening and means providing a closure for said opening, said closure means being movable between an open and closed position, the combination of a baffle board having an opening therein, means for supporting a sound translating device in registry with said last mentioned opening, means supporting said baffle board for movement into and out of said front wall opening, said baffle board being of a size to substantially fill said front wall opening, and means for moving said baffle board to a position within said opening and flush with said closure means upon movement of said closure means to said open position.

2. In a cabinet for sound translating apparatus, said cabinet having a wall provided with an opening and means providing a closure for said opening, said closure means being movable between an open and closed position, an adjustable sound board mounting structure comprising a support mounted within said cabinet, said support including a frame having means for supporting a sound translating device thereon, said support being mounted for movement to and from a first position wherein said frame is disposed in an inactive position within said cabinet and a second position wherein said frame is disposed in an active position in said cabinet, said frame being of a size to substantially fill said wall opening, means connected with said frame for moving said frame into said wall opening to its active position flush with said closure means upon movement of said closure means to said open position.

3. A cabinet for a sound translating device, said cabinet having a front wall provided with an opening therein and closure means for said opening, said closure means being removable from a first position over said front wall opening to a second position adjacent said opening, a baffle board having means for supporting a loudspeaker, said baffle board being mounted within said cabinet for movement into and out of said front wall opening, said baffle board being of a size to substantially fill said front wall opening, and means for moving said baffle board into said front wall opening to form substantially a continuous surface with said closure means when said closure means is disposed in its said second position.

4. In combination with a partition having an opening and means providing a closure for said opening, said closure means being movable between an open and closed position, an acoustic device comprising a loudspeaker having a direct acting diaphragm, a sound board comprising a support for said loudspeaker and having an opening therein, said diaphragm extending through said sound board opening and having the periphery thereof mounted substantially coplanar with said sound board, means mounting said sound board behind said partition for movement into and out of said partition opening, and means connected with said sound board for moving said sound board to a position within said partition opening flush with said closure means upon movement of said closure means to said open position, said sound board being of a size to substantially close said partition opening when disposed therein.

5. In combination with a partition having an opening and means providing a closure for said opening, said closure means being movable between an open and closed position, an acoustic device comprising a loudspeaker having a diaphragm, a sound board comprising a support for said loudspeaker and having an opening therein, said diaphragm extending through said sound board opening and having the periphery thereof mounted substantially coplanar with said sound board, means mounting said sound board behind said partition for movement into and out of said partition opening, and means connected with said sound board for moving said sound board to a position within said partition opening simultaneously with the movement of said closure means to said open position, said sound board being of a size to substantially fill said partition opening.

6. In a sound translating device including a loudspeaker having a diaphragm, the combination with a cabinet having a front wall provided with an opening and means providing a closure for said front wall opening, said closure means being movable between a closed position and an open position, a support frame having an opening, means for mounting said loudspeaker within said frame opening with the periphery of said diaphragm disposed coplanar with said frame, means for supporting said frame within said cabinet for slideable movement between an inactive position wholly within the confines of said cabinet and an active position within said cabinet opening, and means operatively connected with said frame for moving said frame into a position coplanar with the exterior surface of said closure means upon movement of said closure means to said open position.

7. In a cabinet for radio apparatus or the like, said cabinet having a front wall provided with an opening, a baffle board having an opening therein, a loudspeaker having a diaphragm, said diaphragm being mounted in registry with said
baffle board opening and having the plane of the periphery thereof disposed substantially flush with the front face of said baffle board, said baffle board being mounted for movement into and out of said front wall opening, and means operatively connected with said baffle board for moving said baffle board to a position in which it forms a continuous surface with at least a portion of said front wall.

8. A cabinet for a sound translating device, said cabinet having a front wall provided with an opening therein, the portion of said front wall including said opening being inclined to dispose the exterior surface thereof to face upwardly, closure means for said opening carried by said inclined portion, said closure means being mounted for movement from said front wall opening to a position adjacent said opening, a baffle board having an opening therein and means for supporting a loudspeaker within said opening, said baffle board being mounted within said cabinet for movement into and out of said front wall opening, said baffle board being of a size to substantially fill said front wall opening, and means for moving said baffle board into said front wall opening flush with said closure means simultaneously with the movement of said closure means to its said position adjacent said opening.

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