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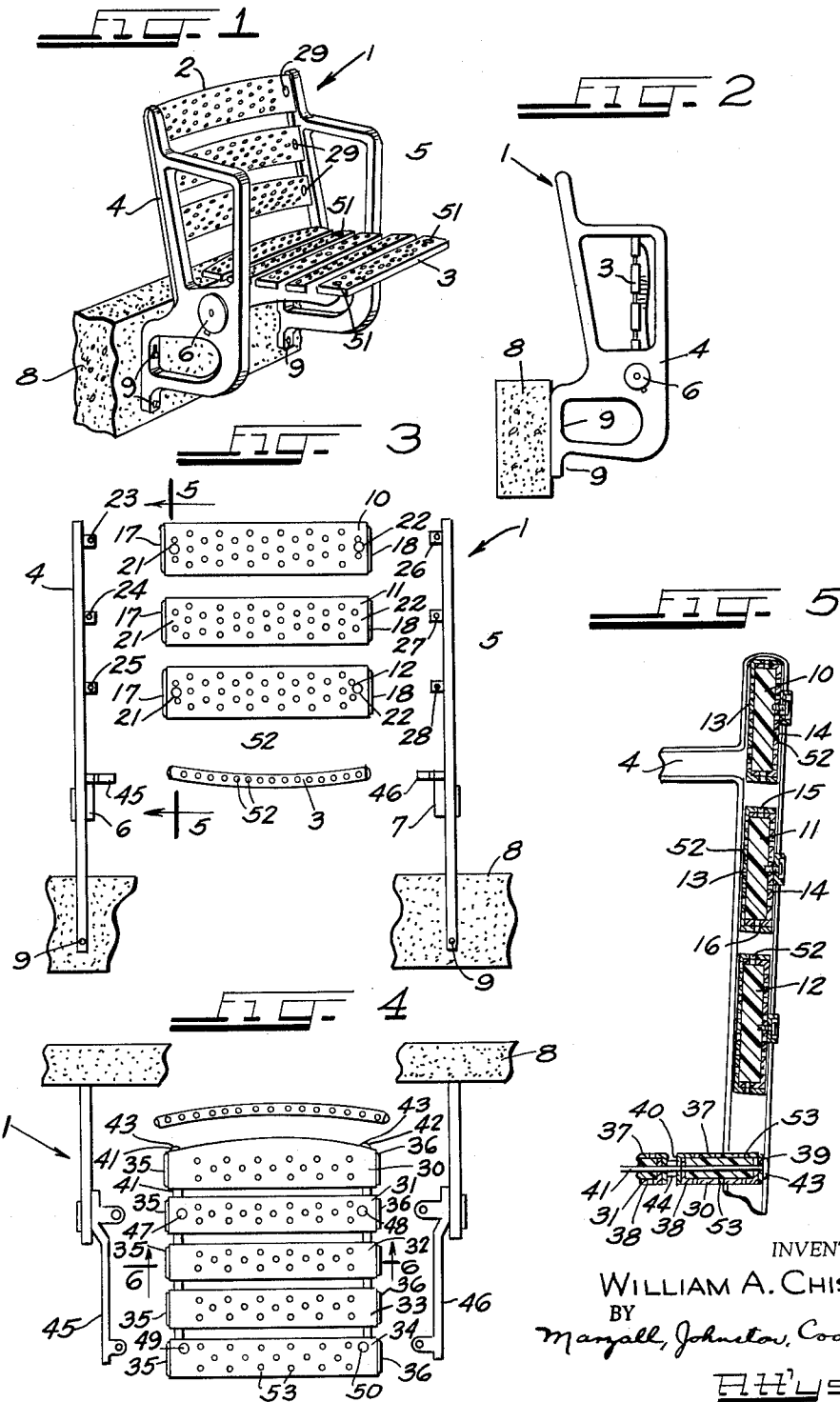
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SEAT STRUCTURES

Filed Jan. 11, 1963

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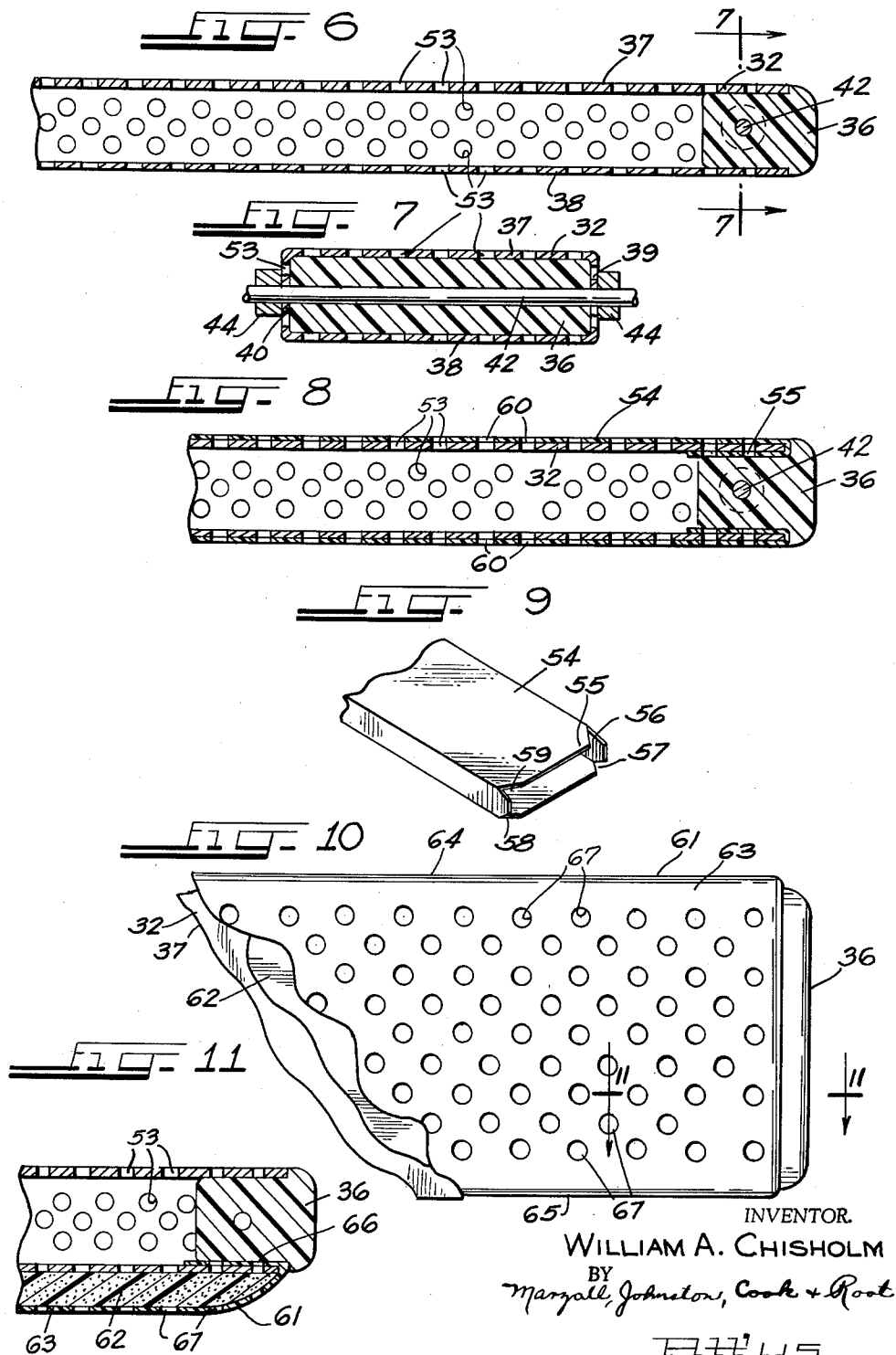
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2 Sheets-Sheet 2



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SEAT STRUCTURES

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This invention relates to seat structures, and, more particularly, to seat structures which are well adapted for use in auditoriums, stadiums, and the like.

In large enclosed stadium which are designed for multi-purpose use, there are occasions when only a portion of the seating capacity is utilized, so that the unused chairs present a problem of sound reflection. It is a primary object of the present invention to overcome such problems.

It is an important object of the present invention to afford a novel seat structure.

Another object is to afford a novel chair of a type well adapted for use in auditoriums, and the like, and having the parts thereof constituted and arranged in a novel and expeditious manner to afford practical and efficient sound deadening properties.

Another object is to enable novel chairs of the pivotable seat type to be afforded, which have good sound deadening characteristics whether the seat portion is in up or down position.

Yet another object is to enable novel chairs of the unpadded or upholstered type to be provided which afford good sound deadening characteristics.

A further object is to enable novel chairs, either of the padded or unpadded type, and embodying the aforementioned sound deadening characteristics to be afforded, wherein the parts thereof are constituted and arranged in a novel and expeditious manner.

Another object is to afford a novel chair of the aforementioned type which is practical and efficient in operation and may be readily and economically produced commercially.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments of the present invention and the principles thereof and what I now consider to be the best mode in which I have contemplated applying these principles. Other embodiments of the invention embodying the same of equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

FIG. 1 is a front perspective view of a chair embodying the principles of the present invention;

FIG. 2 is a side elevational view of the chair shown in FIG. 1, with the seat portion thereof in raised position;

FIG. 3 is an exploded front elevational view of the chair shown in FIG. 1;

FIG. 4 is an exploded top plan view of the chair shown in FIG. 1;

FIG. 5 is a somewhat enlarged, fragmentary detail sectional view taken substantially along the line 5-5 in FIG. 3;

FIG. 6 is an enlarged, fragmentary detail sectional view taken substantially along the line 6-6 of FIG. 3;

FIG. 7 is a detail sectional view taken substantially along the line 7-7 in FIG. 6;

FIG. 8 is a fragmentary detail sectional view, similar to FIG. 6, illustrating a modified form of the present invention;

FIG. 9 is a fragmentary perspective view of a portion of the chair shown in FIG. 8;

FIG. 10 is a fragmentary front elevational view of a portion of a chair, corresponding to the portion shown in FIG. 6, illustrating another modified form of the present invention; and

FIG. 11 is a fragmentary detail sectional view taken substantially along the line 11-11 in FIG. 10.

According to the present invention, a stadium chair is provided with a sound absorbing back or a sound absorbing seat, or both, that eliminates the need for upholstery for sound deadening effects. The chair of this invention preferably comprises a hollow back member which is perforated substantially over its entire area by relatively small openings of a character to inhibit sound transmission and or reflection. If desired, the seat also may be constructed in this way. However, in normal use, when the seat is lowered and occupied, the sound reflecting qualities present no problem. It is only when the seat is not occupied and is in raised position that a sound reflecting problem occurs. For this reason, it is desirable that the under surface of the seat be perforate, since this surface faces forward when the seat is raised.

The invention further provides a chair construction which affords a degree of resiliency to seat elements to provide better comfort. This is accomplished by making the seat of spaced slats which are strung on rods and are hollow and perforate so as to provide the desirable sound absorbing character. This structure may be applied to seat frames of conventional type.

A chair 1, of a type commonly known as a "stadium chair," and embodying the principles of the present invention is shown in the drawings to illustrate the preferred embodiment of the present invention. The chair 1 includes, in general, a back panel or back rest 2 and a seat panel or seat 3 mounted on and supported by two supporting members 4 and 5, the seat panel 3 being pivotally mounted relative to the back panel 2 and the supporting members 4 and 5 by hinge units 6 and 7, respectively, which may be of any suitable type readily available on the market. The side members 4 and 5 are of the type particularly well adapted for supporting a seat structure in a stadium, or the like, and are shown in FIGS. 1-3 secured to a suitable riser 8 by means of bolts 9. However, it will be appreciated by those skilled in the art that other suitable types of supports for seat structures may be used without departing from the purview of the present invention.

The back panel 2 includes three elongated slats in the form of tubular members 10, 11, and 12, FIG. 1. The tubular members 10-12 may be made of any suitable material such as, extruded aluminum, a suitable synthetic resin, or a suitable sheet material, such as, for example, sheet steel, and are preferably substantially rectangular in transverse cross-section, each embodying a front face 13, a rear face 14, an upper edge 15 and a lower edge 16, FIG. 5. It will be appreciated that the back panel 2 is shown as embodying three elongated slats 10-12 merely for the purposes of illustration, and not by way of limitation, and that a greater or lesser number of slats could be used, or the seat panel 2 would be constructed of a single hollow member without departing from the present invention.

The respective ends of each of the tubular members 10-12 are closed by plugs 17 and 18, respectively, FIGS. 2, 4, and 5, which preferably fit into the respective tubular members with a press fit. The plugs 17 and 18, as shown in the drawings, are preferably made from a suitable plastic material such as, for example, polyethylene or polypropylene. However, as will be appreciated by those skilled in the art, the plugs 17 and 18 may be made

of other suitable material such as, for example, a suitable metal such as steel, and such plugs may be omitted, without departing from the purview of the present invention.

Each of the tubular members 10-12 has two openings 21 and 22 through respective end portions thereof from front to back, FIG. 3. The supporting member 4 has three substantially parallel, inwardly projecting ears 23, 24, and 25, and the supporting member 5 has three similar ears 26, 27, and 28 disposed in axial alignment with the ears 23-25, respectively. The ears 23-28 are disposed in such position that, when the tubular members 10-12 are mounted in operative position on the supporting members 4 and 5, the tubular members may be secured thereto by bolts 29 extending through respective ones of the openings 17 and 18 in the tubular members 10-12 and threaded into the ears 23-25, and 26-28, respectively.

The seat panel 3, like the back panel 2, preferably is of a slat-type construction. As shown in the drawings, it includes five elongated slats in the form of tubular members 30, 31, 32, 33, and 34, which are similar in construction to the slats 10-12 of the back panel 2. It will be understood, however, that, as previously stated with respect to the back panel 2, other suitable constructions of the seat panel 3 may be used without departing from the purview of the present invention.

Like the tubular members 10-12, the tubular members 30-34 are preferably rectangular in transverse cross-section, FIG. 5, and may be made of any suitable material such as, for example, sheet steel. The respective ends of the tubular members 30-34 are preferably closed by plugs 35 and 36, respectively, which are similar to the plugs 17 and 18. Each of the tubular members 30-34 embodies an upper face 37, a lower face 38, a rear edge 39 and a front edge 40, FIG. 5. The tubular members 30-34 are secured together in substantially parallel spaced relation to each other by two rods 41 and 42, each of which includes an enlarged head 43. The heads 43 of the rods 41 and 42 are disposed in juxtaposition to the outer face of the rear edge 39 of the tubular member 30, and the rods 41 and 42 extend from the heads 43 forwardly through respective end portions of the tubular members 30-34, and the plugs 35 and 36, respectively, mounted therein, the other ends of the rods 41 and 42 being threaded into the front edge 40 of the tubular member 34. Spacer members 44 are mounted on the rods 41 and 42 between each adjacent pair of the tubular members 30-34 to hold the tubular members 30-34 in spaced relation to each other.

The side members 4 and 5 each include a supporting arm 45 and 46, respectively, pivotally mounted on the hinge mechanisms 6 and 7, respectively, for pivotal movement between the substantially horizontally extending position shown in FIG. 1, and the substantially upright position shown in FIG. 2, forwardly of the back panel 2. The tubular member 31 has two openings 47 and 48 extending through respective ends thereof, and similarly, the tubular member 36 has two openings 49 and 50 extending through respective ends thereof. The arms 45 and 46 are so disposed on the supporting members 4 and 5, that when the seat panel 3 is disposed in operative position relative to the side members 4 and 5, the arms 45 and 46 are disposed in substantially parallel juxtaposition to the rear face of the seat panel 3. The openings 47-50 are so disposed on the seat panel 3, that bolts 51 may be inserted therethrough and threaded into the underlying arms 45 and 46. With this construction, it will be seen that the seat panel 3 may be mounted on and removed from the supporting members 4 and 5 as a unit.

The present invention affords a novel seat having good sound deadening properties for the purpose of affording good acoustical characteristics in stadiums, auditoriums, and the like. As may be seen in FIGS. 1-7, inclusive, in the preferred embodiment of the invention all of the faces 13 and 14 and all of the edges 15 and 16 of the tubular members 10-12 are substantially completely covered throughout their length and width, by a plurality of rela-

tively closely spaced openings 52. Similarly, all of the faces 37 and 38, and all of the edges 39 and 40, of the tubular members 30-34, inclusive, are substantially completely covered by corresponding relatively closely spaced openings 53.

One of the important aspects of the present invention is that the back panel 2 and the seat panel 3 in all operative positions thereof in a seat structure, such as, for example, the chair 1, afford surfaces wherein openings therethrough comprise a substantial portion thereof. I prefer that all of the surfaces afforded by the back panel 2 and the seat panel 3 be so constructed, but I particularly desire to have, at least, the surfaces which, in an unoccupied seat, face directly forward in an auditorium, stadium, or the like, in which my novel chairs 1 are used, be so constructed. With this construction, it will be seen that the surfaces of such chairs which are most directly subjected to sound waves, namely, the surfaces facing directly toward the speaker, or the like, afford surfaces having good sound deadening characteristics. In accordance with these principles, it will be seen that the chair 1, having the aforementioned construction, affords such surfaces on the back panel 2 and the seat panel 3 whether the seat panel 3 is in the lowered position shown in FIG. 1, or is in the raised position shown in FIG. 2 wherein the bottom surfaces 38 of the tubular members 30-34 face substantially directly horizontally outwardly away from the back panel 2.

The openings 52 and 53 may be of any practical size. However, although the openings 52 and 53 are shown in the drawings in somewhat exaggerated scale, for the purposes of legibility, I prefer that they be relatively small and relatively closely spaced, such as, for example, that they be approximately three-thirty-seconds of an inch in diameter, and be spaced apart approximately one-fourth of an inch in all directions. With such construction, good acoustical characteristics are afforded, while also affording comfortable surfaces for supporting the occupant of such a chair.

In FIGS. 8 and 9 a modified form of the present invention is illustrated, with parts which are the same as corresponding parts shown in FIGS. 1-7 indicated by the same reference numerals. The only differences in construction between the modified form of the invention shown in FIG. 8, and the preferred form of the invention shown in FIGS. 1-7, inclusive, are that the tubular members 10-12 and 30-34 each have a coating or layer of sheet material on the outer face thereof, and the tubular member 32, shown in FIGS. 8 and 9, is shown as an extrusion rather than as being formed from sheet metal, as shown in FIGS. 1-7. Coatings or layers of sheet material on the faces of the tubular members 10-12 and 33-37 are afforded by covers on each of the respective tubular members 10-12 and 33-37, each cover being in the form of an elongated sleeve 54, as illustrated in FIGS. 8 and 9, the sleeve 54 being shown in FIG. 8 mounted on the tubular member 32.

The cover or sleeve 54 can be made of any suitable material, such as, for example, leather or a suitable plastic, such as, for example, a polyvinyl chloride or a polyvinyl fluoride sheet material, and is preferably adhesively secured to all of the outer surfaces of the tubular member 32. The cover 54 can be coextensive with the outer surface of the member 32 or it can have end portions 55 on each end thereof which may be turned inwardly into the tube 32, FIG. 8, all four corners of the end portions 55 being preferably notched as indicated as 56, 57, 58, and 59, in FIG. 9 to facilitate the turning in of the respective end portion 55.

In the modified form of the invention shown in FIG. 8, the plugs in the ends of the tubular members, such as, for example, the plug 36 shown in FIG. 8, when disposed in normal operative position therein, are effective to clampingly hold the end portions 55 of the sleeves 54 in each of the respective tubular members, as is specifically illustrated with respect to the tubular member 32. The

sleeves 54 on each of the tubular members 10-12, and 30-34 in the modified form of the invention shown in FIG. 8, have openings 60 therethrough, each of the openings 60 being of the same size, and being disposed in overlying axial alignment with a respective one of the openings 52 or 53 in the tubular members 10-12 or 30-34, respectively.

With the construction illustrated in FIGS. 8 and 9, it will be seen that a chair may be afforded which has the same advantages as the chair 1 shown in FIGS. 1-7, with the additional advantage that the outer surfaces of the back panel and seat panel thereof have a covering thereon, which affords heat insulation, and a decorative appearance. It will be appreciated by those skilled in the art that although the covers on the tubular members 10-12 and 30-34 are shown in FIGS. 8 and 9 as complete sleeves 54, the present invention is not limited thereto and other types of covers, such as covers comprising individual sheets of material secured to respective outer surfaces of the tubular members 10-12 and 30-34 may be used without departing from the purview of the present invention.

In FIGS. 10 and 11, another modified form of construction of a chair, such as the chair 1, shown in FIGS. 1-7, is illustrated, the only difference between FIGS. 10 and 11, and the form of the invention shown in FIGS. 1-7, inclusive, being that FIGS. 10 and 11 illustrate a novel construction whereby padding or upholstery may be afforded on the faces of back and seat panels, such as the back and seat panels 2 and 3, respectively. Normally, if upholstery or padding were to be used on a chair such as the type of chair shown in FIGS. 1-7, only the front faces of the back panel 2, afforded by the faces 13 of the tubular members 10-12, and only the upper face of the seat panel 3, afforded by the faces 37 of the tubular members 30-34 would be so upholstered. Hence, in FIG. 11, which is similar to FIG. 6, only the upper face 37 of the tubular member 32 is shown as being padded.

The upholstery 61 shown on the upper face 37 of the tubular member 32 in FIG. 10 includes a suitable pad 62 which may be made of any suitable material such as, for example, sponge rubber, or a suitable plastic material such as, for example, a polyurethane, and an outer cover 63. The pad 62 may be adhesively secured to the face to be upholstered, such as, for example, the upper face 37 of the tubular member 32, and the cover 63 may then be placed in covering relation thereto. The front and rear edges 64 and 65 of the cover 63 may be adhesively secured to the front and rear edges 40 and 39, respectively, of the tubular member 32. The end portions 66 of the cover 63 may be folded inwardly into the tubular member 32, into such position that when the plugs, such as the plug 36 shown in FIG. 11, are disposed in normal operative position in the tubular members 10-12 and 30-34, they clampingly engage the respective end portions 66 to thereby hold them in position in the respective tubular members. It will be appreciated that although only the tubular member 32 is shown in FIGS. 10 and 11, the other tubular members 10-12, 30, 31, 33, and 34, would preferably be covered in the same manner in a chair constructed in accordance with the principles of the modified form of the present invention illustrated in FIGS. 10 and 11.

Preferably, the cover 63 has a plurality of openings 67 therethrough, which are of the same size, and are disposed in the same position relative to each other, as are the openings 52 and 53 in the tubular members 10-12 or 30-34, on which the particular respective upholstery 61 is mounted. Although the openings 67 in the upholstery 61 are not as important in the type of construction shown in FIGS. 10 and 11, as they are in the types of construction shown in FIGS. 1-7 and 8-9, because the upholstery 61, itself, affords quite effective sound deadening properties, the openings 67 do enhance the acoustical characteristics, and, in addition, afford a pleasing decorative ap-

pearance which blends well with the appearance of the other perforated surfaces of the tubular members on which the upholstery is mounted.

It will be appreciated by those skilled in the art that, if desired, the back panels and seat panels of chairs constructed in accordance with the present invention may be filled or partially filled with rock wool, polyurethane, or other suitable sound absorbing materials without departing from the purview of the present invention. It is desirable to have the interior of the panels hollow with the interior space communicating with said holes. An advantage of the present chair is the ventilation afforded by the holes or perforations in the seat and back.

From the foregoing, it will be seen that the present invention affords a novel seat or chair construction which is particularly well adapted for use in stadiums, auditoriums, and the like.

Also, it will be seen that the present invention affords a novel chair construction which affords highly practical and efficient sound deadening properties and thereby affords a construction having good acoustical characteristics for use in auditoriums, stadiums, and the like.

Also, it will be seen that the present invention affords a novel chair which is practical and efficient in operation and which may be readily and economically produced commercially.

Thus, while I have illustrated and described the preferred embodiments of my invention, it is to be understood that these are capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. A chair comprising
 - (a) supporting means,
 - (b) a back panel including a plurality of elongated tubular members disposed in substantially parallel spaced relation to each other and each having a front face and a rear face,
 - (c) said back panel being mounted on said supporting means in upstanding position,
 - (d) and a seat panel including a plurality of elongated tubular members disposed in substantially parallel spaced relation to each other and each having a top face and a bottom face,
 - (e) said seat panel being movably mounted on said supporting means for movement between one position wherein said top and bottom faces extend substantially horizontally and another position wherein said top and bottom faces extend substantially vertically,
 - (f) each of said tubular members having a plurality of openings therethrough substantially equally spaced across the entire surface of each of said faces.
2. A chair as defined in claim 1 and
 - (a) which includes covers of flexible material mounted on said tubular members in covering relation thereto, and
 - (b) in which said covers have openings therethrough in axial alignment with said openings in the respective ones of said tubular member on which said covers are mounted.
3. A chair as defined in claim 2, and
 - (a) in which
 - (1) said covers comprise elongated sleeves, and
 - (2) the ends of said sleeves are turned inwardly into the ends of said respective tubular members, and
 - (b) which includes plugs mounted in the ends of said tubular members in clamping engagement with said sleeve ends.
4. A chair as defined in claim 1, and
 - (a) which includes plastic covers adhesively secured to the outer surfaces of respective ones of said tubular members in covering relation thereto, and

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- (b) in which said covers have openings therethrough in axial alignment with said openings in said respective tubular members.
5. A chair comprising
- (a) supporting means,
- (b) a back panel mounted on said supporting means in upstanding position,
- (c) said back panel having a front face,
- (d) a seat panel mounted on said supporting means forwardly of said back panel,
- (e) said seat panel having a top face and a bottom face,
- (f) cushions mounted on said front and top faces,
- (g) said cushions comprising
- (1) padding disposed on said front and top faces, and having portions facing outwardly from said last-mentioned faces, and
- (2) covers mounted on said portions in covering relation thereto,
- (h) said covers having a plurality of holes therethrough substantially equally spaced completely thereacross, and
- (i) the remainder of said panels having a plurality of holes therein substantially equally spaced thereacross.
6. A chair as defined in claim 1, and in which said tubular members are metal members.
7. A chair as defined in claim 1,

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- (a) and which includes means extending through the end portions of said tubular members for securing said tubular members to said supporting means, and
- (b) in which said seat panel
- (1) is mounted on said supporting means forwardly of said back panel and
- (2) is removable from said supporting means as a unit.

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