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Anderson

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[54] FOLDING STADIUM CHAIR

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[52] **U.S. Cl.** **297/332**, 297/336

[51] **Int. Cl.** **A47c 1/12**

[58] **Field of Search** 297/332, 333, 335, 297/336, 249; 287/101; 248/383

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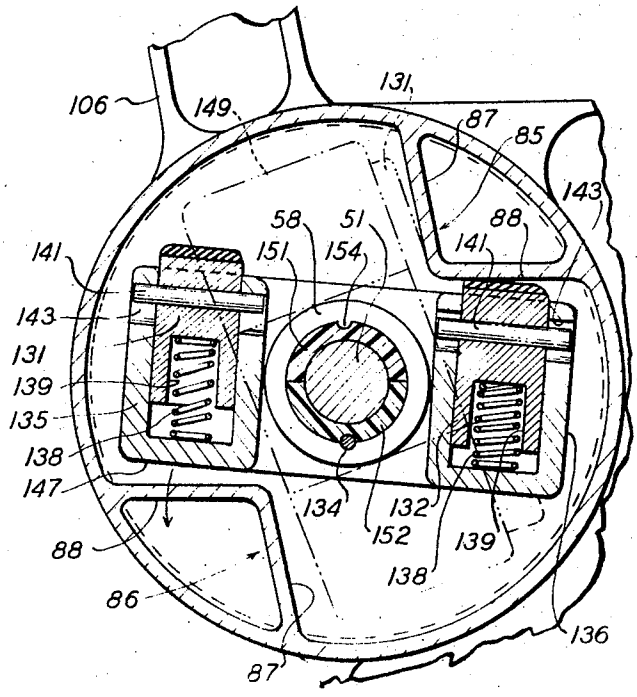
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Primary Examiner—Francis K. Zugel

[57] **ABSTRACT**

A stadium chair has spaced pairs of vertical side members with attachment means at the bottom of each side member pair for attachment to the riser face or the horizontal platform of the stadium row. The vertical members support pivot plates at the level of the seat. Fiberglass, plastic or cast or forged metal seat surfaces are attached to the pivots. The rear edge of each seat is weighted. Each vertical side member pair has a registry hub that includes a pair of arcuately spaced stops against which resilient locators on the seat register to predetermine occupied and unoccupied seat attitudes. A back rest is attached to spaced support members extending from the vertical side members. Preferably the registry hubs are compound such that side members between adjacent seats accommodate pivots for both seats.

5 Claims, 11 Drawing Figures



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SHEET 1 OF 3

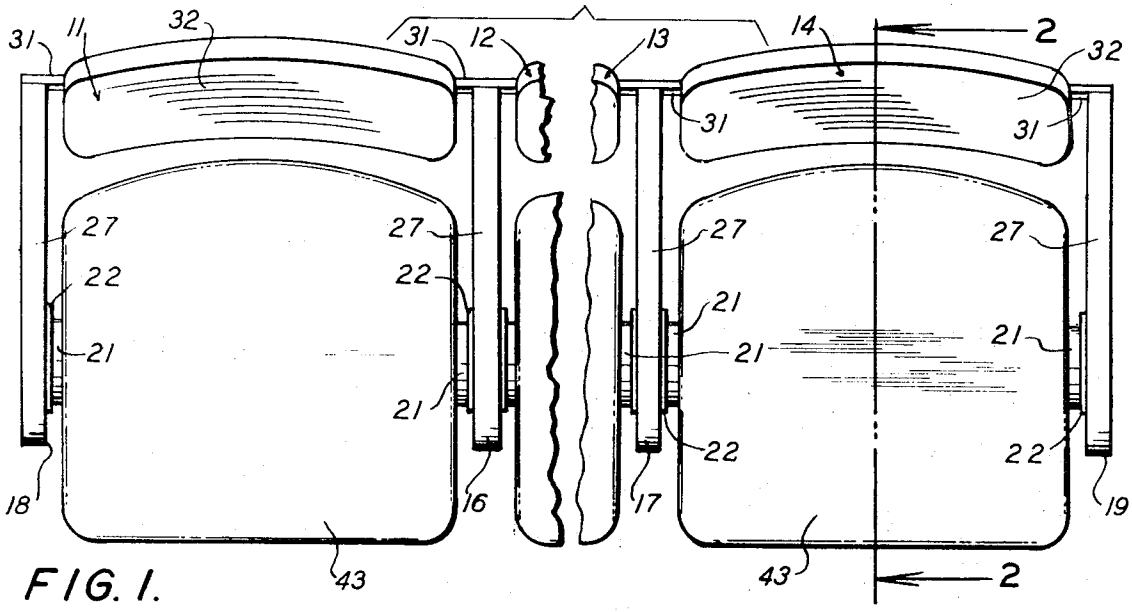


FIG. 1.

FIG. 2.

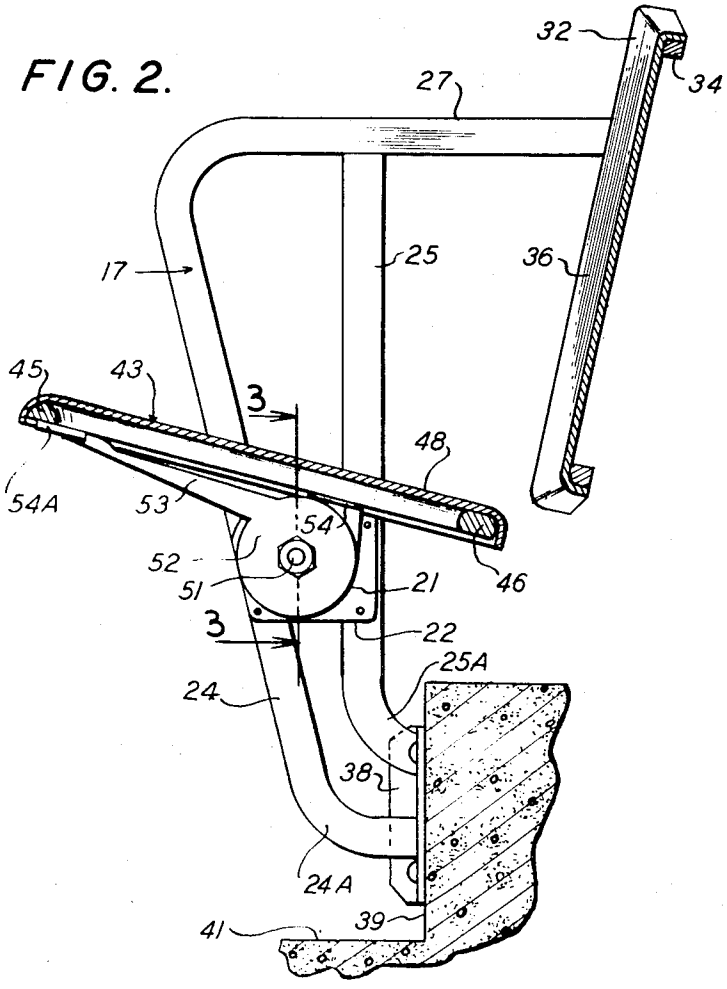
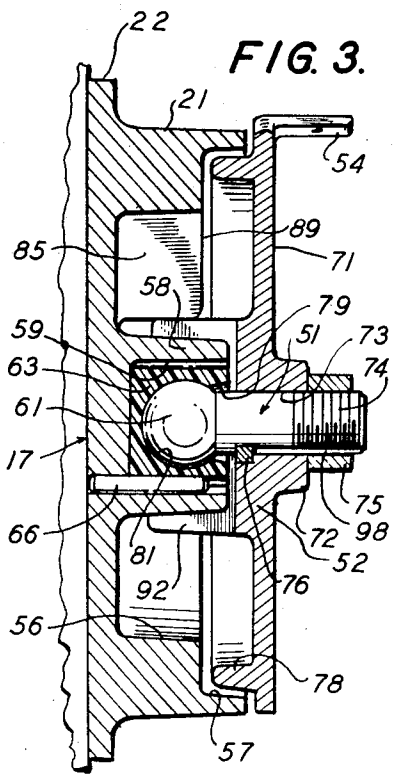


FIG. 3.



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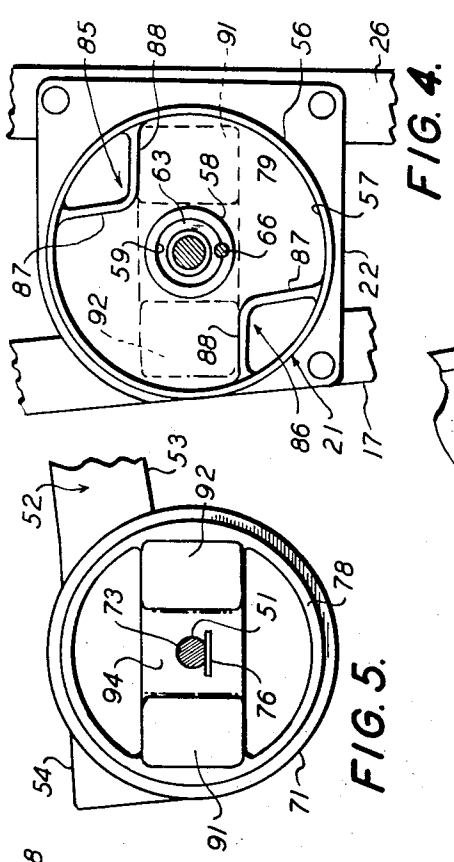


FIG. 4.

FIG. 5.

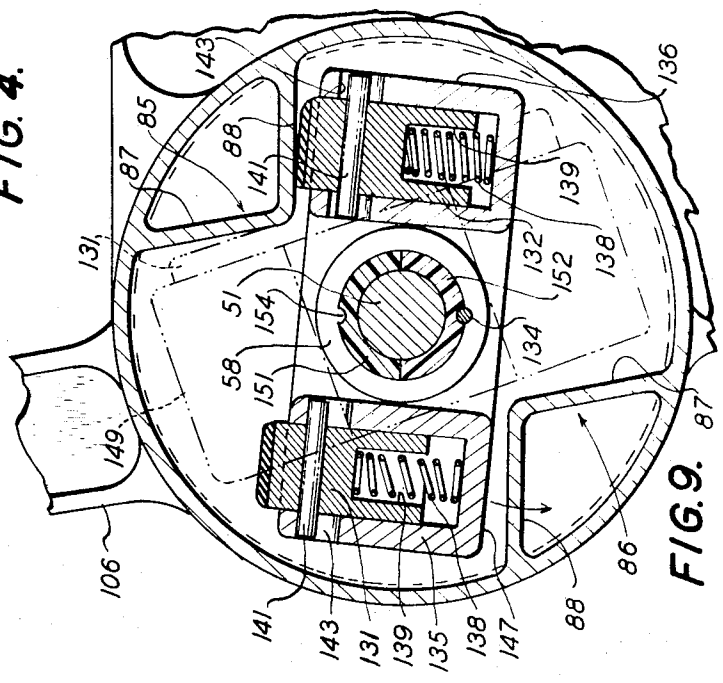


FIG. 9.

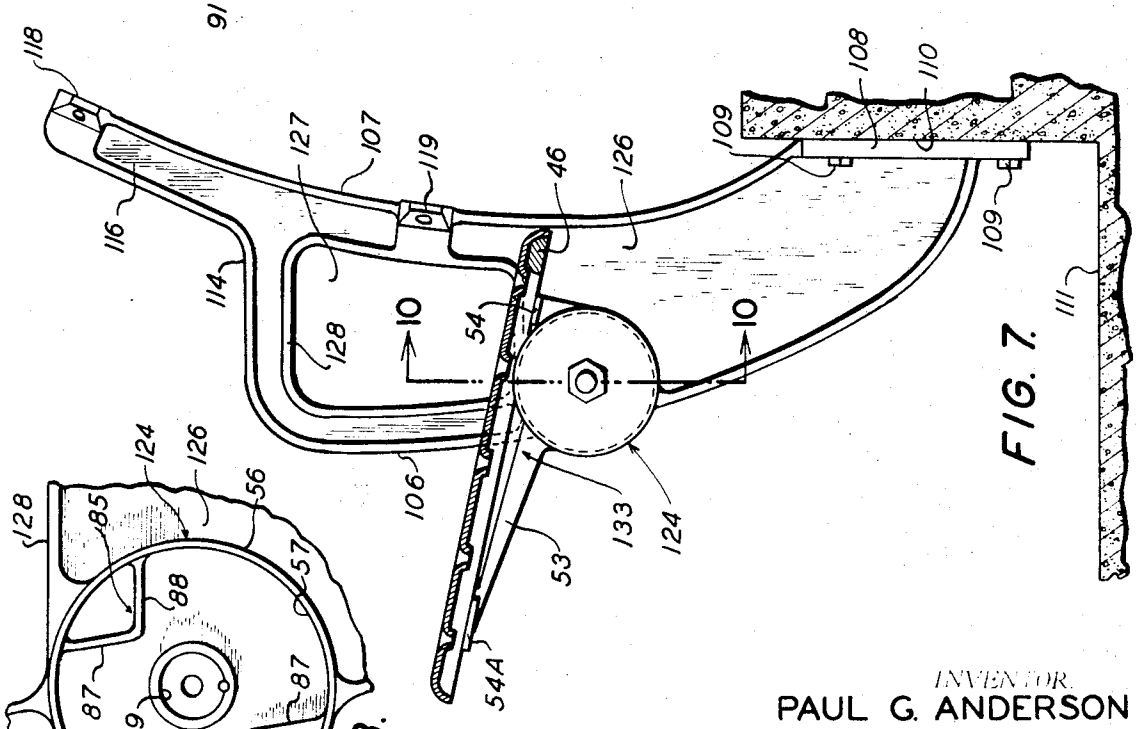


FIG. 7.

FIG. 8.

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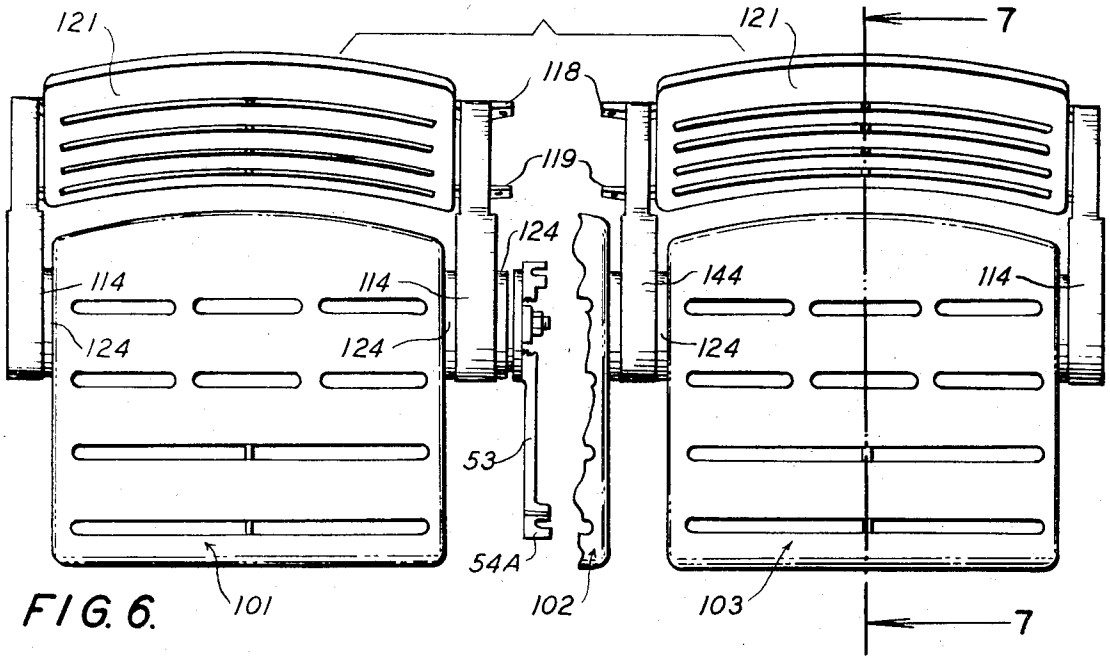


FIG. 6.

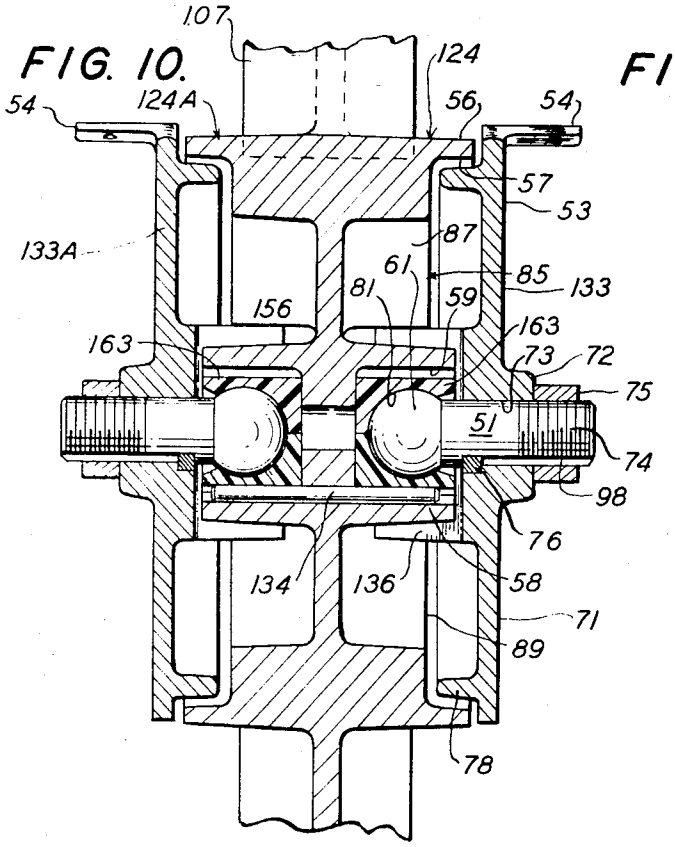


FIG. 10.

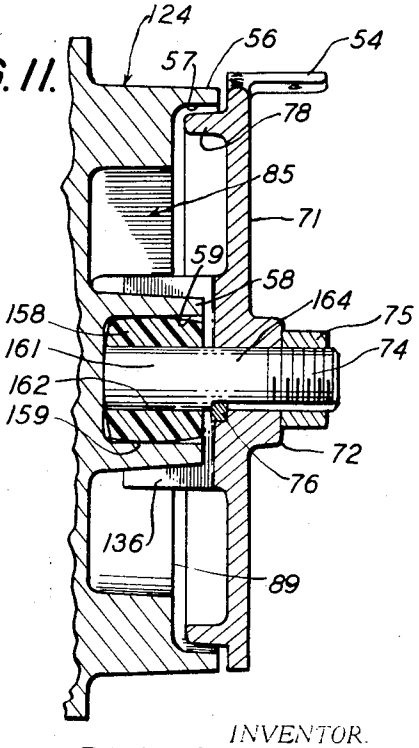


FIG. 11.

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FOLDING STADIUM CHAIR

This application is a continuation-in-part of copending patent application Ser. No. 853,695 filed Aug. 28, 1969 and entitled "Stadium Chair With Folding Seat," now U.S. Pat. No. 3,638,998.

BACKGROUND OF THE INVENTION

The invention relates to stadium and theater chairs in which the seat folds to maximize the exit aisle for the chair occupants.

Stadium chairs must be designed to seat comfortably the maximum number of people within the stadium or theater confines. Fire and safety ordinances dictate the distance between rows essential for exit in accordance with safety standards. Seat front-to-back width is therefore a compromise between the desire for a maximum number of rows of chairs safely allowable and the user's comfort requirements. Therefore, it is desirable to provide a chair whose components use part of the required exit aisle space when occupied but which automatically retracts or folds back from the aisle those forward components projecting so as to leave the minimum required row to row spacing when the seat or chair is vacated.

The chairs are conventionally used in large quantities and cost per chair is a major consideration in selecting a design for a particular site. Complicated folding mechanisms are therefore unwanted. Since the seat occupant cannot be depended upon to raise the seat upon leaving the chair, any seat retraction that takes place is required to be automatic when the seat is vacated. I have invented a stadium chair which is comfortable, simple to fabricate in quantity and which has seat components that fold automatically to accomplish desired row to row aisle clearance.

SUMMARY OF THE INVENTION

The invention contemplates a stadium chair wherein pairs of vertical members are spaced apart with each pair rising from means for attaching the chair to the horizontal or vertical surfaces of the stadium floor and riser defining the stadium row. A pivot support plate connects the individual vertical members of each vertical pair adjacent the chair seat level. The seat and the back rest are preferably of a molded metallic or plastic material secured between the vertical member pairs. Pivots, which preferably include self-lubricating bushings, project from the pivot support plates and attach to the seat at the opposed sides thereof. Each pivot support comprises a registry hub in which circumferentially spaced registry stops are adapted to be contacted by resilient contact members carried by a seat support arm at each side of the seat. One stop and contact member pair associated with a registry hub maintain the seat level when it is occupied. The rear of the seat is weighted or biased to swing downwardly at the rear when the seat is vacated. A second associated pair of stop and contact members determine the folded attitude of the seat. The contact members on the seat support arm at each side of the seat are resilient to provide overtravel of the seat beyond its registry attitude to give more room between adjacent rows. Back rest supports extend from the vertical members of each side member pair to support each back rest. The seat is restrained by the registry stops and contact members from touching the back rest when the seat automatically folds to an upright position.

An object of the invention is to provide a stadium or theater chair which attaches to either the horizontal or the vertical surface defining the stadium or theater row.

Another object of the invention is to provide a chair which is proportioned to hold a user comfortably and which folds such that the space between adjacent chair rows is wide enough for easy exit from the row. A further object of the invention is to provide means of registering the articulating seat in both occupied and folded, unoccupied positions, with the registry elements being shrouded against deterioration within a registry hub.

These and other advantages of the invention are apparent from the following detailed description and drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary plan view of a row of stadium chairs in accordance with the invention joined in a row;

FIG. 2 is a sectional elevation taken along line 2—2 of FIG. 1;

FIG. 3 is a fragmentary sectional elevation taken along line 3—3 of FIG. 2;

FIG. 4 is a detail view of the registry hub of the embodiment of FIG. 1;

FIG. 5 is a fragmentary detail view of the contact arm of the seat partly in section;

FIG. 6 is a fragmentary front elevation of an alternate chair embodiment shown joined to others in a row;

FIG. 7 is a sectional elevation taken along line 7—7 of FIG. 6 with the back removed;

FIG. 8 is a detail view of the registry hub of the embodiment of FIG. 6;

FIG. 9 is a fragmentary sectional elevation through the registry hub of the chair of FIG. 6;

FIG. 10 is a sectional view taken along line 10—10 of FIG. 7 with the seat removed; and

FIG. 11 is a fragmentary sectional view similar to FIG. 10 of a further alternate embodiment.

In the various views like parts are similarly numbered.

One embodiment of the invention is illustrated in FIGS. 1–5. In FIG. 1 a plurality of stadium or theater chairs 11, 12, 13 and 14 are joined together by similar vertical side members 16, 17 and the end chairs 11 and 14 are stabilized by terminating side members 18 and 19. Each side member has a registry hub 21 attached to it by means of a mounting plate 22. The hub and plate may be integral. The plate is fastened in each instance to a front vertical brace 24 and a rear vertical brace 25 of the vertical side member. Each front vertical brace is bent horizontally to define a back support 27 which extends rearwardly of the chair. Each back support has a transverse end piece 31 to which a seat back 32 is fixed.

The seat back has a metallic frame 34 to which a molded plastic back member 36 is secured by suitable fasteners extending through the member to the frame.

The lower ends 24A, 25A of the front and rear vertical braces of the side member 17 of FIG. 2 are curved and attached to a mounting bracket 38 by which the side member is fixed to the riser face 39 of a stadium or theater row. The row is defined by the riser face 39 and a floor surface 41. In an alternative embodiment the vertical members may extend without curving portions

and be fixed to a bracket (not shown) adapted to secure the side member to the floor surface instead of the riser.

Turning again to FIG. 2, it can be seen that a chair seat 43, like the seats 43 of the chairs 11–14 of FIG. 1, is in occupied position. In that FIG. 2 the chair seat shown includes a metallic frame 45 which has a heavy portion 46 at its rearward boundary and to which a seat member 48 is suitably secured. A pivot bolt 51 supports a seat frame bracket 52 which has a front support arm 53 and a rear support flange 54. Suitable fasteners secure the seat frame to the arm and flange of the frame bracket on each side of the chair.

In FIG. 3 the relationship of the frame bracket 52 to the registry hub 21 is shown in sectional elevation. The registry hub has an inner annular wall 56 and an outer annular wall 57 concentric therewith and having a larger diameter. The hub also has a central boss 58 with a central cylindrical chamber 59 within which the semi-spherical head 61 of pivot bolt 51 lodges. A self-lubricating bushing 63 intervenes between the chamber wall and the head. Preferably the bushing is of a resilient plastic material such as Teflon or other material which is self-lubricating and which is capable of recovery from distortion to snap around the spherical head and remain attached to the head.

A lock pin 66 engages the bushing and the boss to maintain the bushing in the proper position.

Each seat frame bracket has an outer plate 71 with a protruding boss 72 which is apertured at 73 to receive the shank 74 of the pivot bolt 51. The shank is threaded and receives a retaining nut 75. A keeper 76 protruding from the apertured wall positions the bolt axially within the frame bracket.

The frame bracket has an inwardly projecting annular flange 78 whose outer diameter relative to the inner diameter of outer chamber 57 of the registry hub provides free running between the two surfaces. The frame bracket is thus free to revolve about the axis of the pivot bolt with the overlap between the bracket flange and the hub chamber precluding admission to the hub of deteriorating materials such as liquid and dirt.

The pivot bolt head is free to move in the bushing in response to rotation of the frame bracket. It is also desirable that the pivot bolt be capable of off-axis positions to compensate for misalignments of the seat with respect to the side member as may be occasioned by uneven floors or curving rows. Therefore, a conical relief chamfer 79 at the open end of the bushing enables the bolt to move off-axis with respect to the spherical bushing opening 81. Such motion also requires clearance between chamber 57 and flange 78 greater than required just to provide rotating freedom between the two parts, since the motion of the frame bracket is then slightly eccentric with respect to the hub.

The described components provide for arcuate movement of the seat about the pivot bolts 51. In order to provide stops for the positioning of the seat in occupied and retracted positions, further elements are combined with those for arcuate movement. The registry hub 21, for instance, on each side of the seat has diametrically opposed registry stops 85, 86, each of which is defined by a pair of diverging ribs 87, 88 extending outwardly from the back of the registry hub to flush with a bottom 89 of outer annular wall 57, as can be seen in FIG. 3.

The frame bracket has inwardly protruding contact members 91, 92 of which contact member 92 is visible in FIG. 3, as well as FIG. 5. The contact members are divided by an interval 94 into which central boss 58 of the registry hub fits when the frame bracket and the registry hub are assembled.

In FIG. 4, the contact members 91, 92 are shown in dotted lines in registry with the ribs 88 of the registry stops 85, 86, respectively. As can be appreciated from an inspection of FIG. 5, the dotted line position therein indicates a substantially horizontal attitude for frame bracket 52 such that the seat is in occupied position, as in FIG. 2. When the seat is unoccupied, biasing weight 46 swings the seat about the pivot bolts 51 such that the contact members 91, 92 approach the outer surface of ribs 87 of each of the stops. In this position the attitude of the seat is substantially vertical. The top of the seat may be further moved toward the back 36 until contact is made between the contact members and the ribs 87 of both registry stops. Full spacing between the seat of one row and the back of the lower adjacent row is thus established.

The lock pin 66 normally retains bushing 63 within the registry hub. If the bushing is resilient or is split, frame bracket 52 may be removed from the registry hub without removing the pivot bolt 51 therefrom. Alternatively, nut 75 may be removed and the frame bracket removed from the pivot bolt with retainer 76 being displaceable with respect to the bolt because of flat 98 on the bolt. In either configuration the seat frame brackets are easily removed from the registry hub of the side members to disassemble the chair.

In the embodiment of the invention illustrated in FIGS. 6–10 a plurality of chairs, such as the chairs 101, 102, 103 may comprise a row. Each chair has pairs of separated side members, such as the side members 106, 107 of FIG. 7, which members each terminate in attachment plate 108 which is fixed by bolts 109 to a riser 110 of a row step 111.

Side member 106 extends in a horizontal arm portion 114 which joins to side member 107 in a back support portion 116. Attachment cleats 118, 119 protrude from the side member 107 to receive a back, such as the backs 121, which are not shown in FIG. 7. As is conventional, the adjoining chairs share the pair of side members between them and registry hubs 124 extend from either side of the side members toward the seat. The side members at the end of each row conventionally have hubs extending only in one direction.

As can be seen in FIG. 7, the side members of each pair may be connected by a web 126. To reduce weight and material, the web has an aperture 127 defined by a closed figure flange 128. In part, the registry hub at each side member pair extends from the web 126. As can be seen from FIG. 8, each registry hub 124 is substantially similar to the hub of the previously described embodiment, having an annular wall 56 defining an annulus 57 and a central boss 58 with an annulus 59 therein extending from the vertical wall 126A of the registry hub. Registry stops 85,86 are diametrically opposed within annulus 57, as in the previously described embodiment. Each registry stop has stop surfaces 87, 88, against which the contact members 131, 132 of a seat frame bracket 133 register to determine seat position.

FIG. 10 shows hubs 124, 124A extending toward adjacent seat frame brackets 133, 133A of adjacent seats (not shown). The seats share the side member pair 106, 107, as for instance, seats 101, 102 of FIG. 6. Each hub is like the hub 124 of FIG. 8.

The frame brackets 133, 133A are substantially identical and a description of one will suffice for both. They are, of course, right and left hand types. Each frame bracket has an elongate arm 53 terminating in attachment flanges 54, 54A. An exterior boss 72 with an aperture 73 fits about a pivot bolt 51. The bolt has a spherical head 61 within a split bushing 163 and a threaded shank 74 extending outwardly of the boss. A nut 75 secures the bolt in the frame bracket, which in turn is secured by the bolt in the registry hub. A lock pin 134 common to the bushings 63 of both hubs 124, 124A holds the bushings in place.

The outer plate 71 of the frame bracket has an inner flange 78 which resides inside annular wall 57 of the hub. The overlap of the flange and wall precludes entry of dirt into the hub, protecting the moving parts thereof from deterioration.

From plate 71 a pair of separated contact member guides 135, 136, of which guide 136 is visible in FIG. 10, extend into the registry hub. Guide 135 contains contact member 131 and guide 136 contains contact member 132. Each member is biased outwardly by a compression spring 138 lodged in a cavity 139 of the member. Each contact member carries a transverse limit pin 141 which extends into slots 143 on each side of the guide containing the member to limit the travel of the member with respect to the guide

In FIG. 9, the seat is shown in the process of descending under the weight of an occupant. When fully seated, contact member 132, with its contact pad 145, rests against registry rib 88 of stop 85, while the end wall 147 of guide 135 of contact member 131 rests against rib 88 of stop 86. The weight imposed upon the seat is thus absorbed by both stops of the registry hub.

The broken lines 149 of FIG. 9 illustrate the attitude of the contact members when the seat is unoccupied and biased into vertical position by the weight 46 at the back edge of the seat (FIG. 7). Freedom for further movement of the seat front edge toward the back of the chair is afforded by the resilience of the contact member 131 touching rib 87 of registry stop 85.

The pivot bolt bushing 163 is divided into upper and lower halves 151, 152, respectively, for ease in assembly and fabrication. Each half is indented peripherally at 154 to provide for the lock pin. Each half is also chamfered to allow off-axis freedom for the pivot bolt shank as the spherical head 61 of the bolt moves in a socket 81 defined by the two bushing halves.

In the further alternate embodiment shown in FIG. 11, the pivot bolt bushing 158 is not split, but differs from the previously described bushings 63 and 163 in having a barrel-like outer configuration. The periphery 159 is generated by an arc revolved about the axis of a central cylindrical chamber 161 within which a cylindrical pivot bolt shank 162 of a headless pivot bolt 164 resides. Off-axis freedom is imparted by the ability of the bushing 158 to rock within the cylindrical chamber 59 of boss 58.

In other respects the embodiment of FIG. 11 is substantially identical to the embodiment of FIG. 7, both operating automatically to fold the seat when empty and registering the seat in occupied position. In all embodiments the moving parts are shrouded within the registry hub away from damage, although easily accessible for adjustment or disassembly.

Modifications within the scope of the invention other than those shown will occur to those skilled in the particular art. It is therefore desired that the invention be measured by the appended claims rather than by the illustrative disclosures made herein.

I claim:

1. A folding chair comprising side members spaced apart to define the chair width, attachment means at the bottom of each side member, a chair back secured between the side members, a chair seat, a seat weight at the back of the seat, a seat support bracket at each side of the seat adjacent a side member, means securing the seat to the bracket; a cylindrical shroud projecting from each side member toward a seat, a registry stop in the shroud adapted to register the seat support bracket in occupied position, a registry stop in the shroud adapted to register the seat support bracket in unoccupied position, a pivot in each support bracket, a bushing journalling each pivot within the shroud; and contact members on each seat support bracket adapted to extend into the shroud to contact a registry stop, each of said contact members including a contact guide, a contact within the guide, and a spring biasing the contact toward a registry stop.

2. A folding chair in accordance with claim 1 further comprising a flange on each support bracket adapted to extend within each side member shroud adjacent thereto so as to inhibit entry of foreign matter.

3. A folding chair in accordance with claim 1 further comprising a pivot boss central of each shroud securing the pivot bushing, and means securing the pivot in the seat support bracket.

4. A folding chair in accordance with claim 1 wherein each registry stop comprises a first rib extending from the wall of said shroud inwardly, a second rib extending inwardly from the wall of the shroud to join the first rib at its inward termination, each rib of one registry stop being substantially parallel to a rib of the other registry stop, and both ribs of a registry stop defining a dihedral angle.

5. A folding chair in accordance with claim 4 further comprising a flange on each support bracket adapted to extend within each side member shroud adjacent thereto so as to inhibit entry of foreign matter.

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