Dec. 13, 1966 A. F. KRUEGER 3,291,523

STACKABLE CHAIR

Original Filed Nov. 16, 1959 2 Sheets-Sheet 1

Fig. 1.

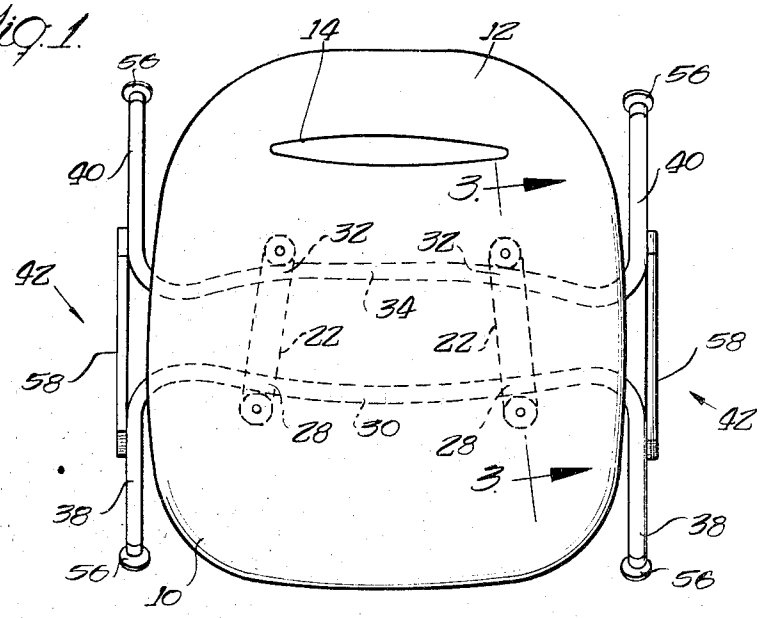


Fig. 4.

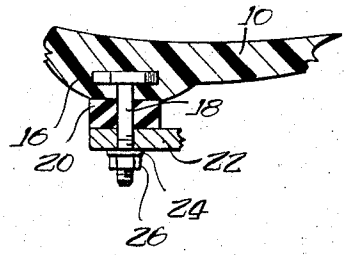
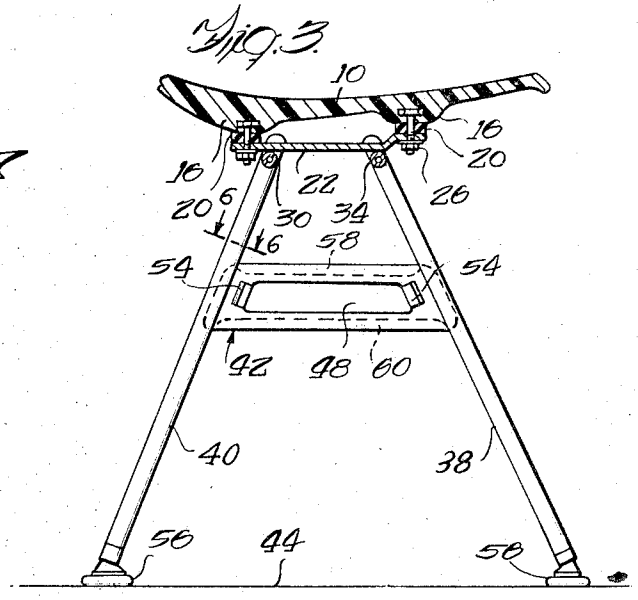


Fig. 3.



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Fig. 2.

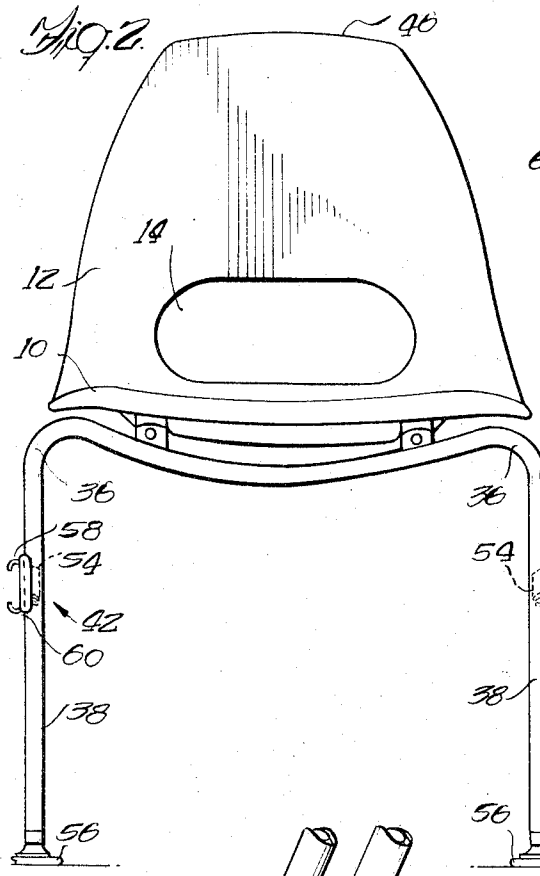


Fig. 6.

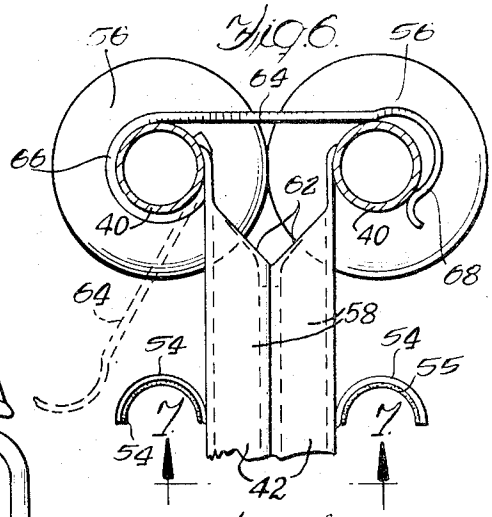


Fig. 7.

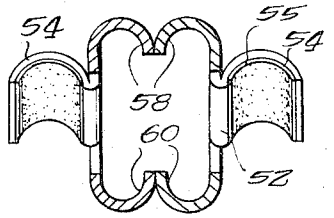
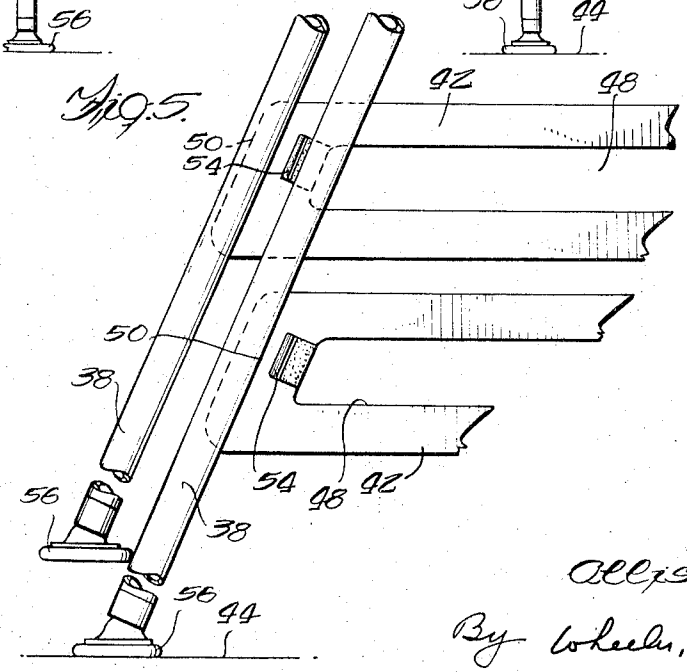


Fig. 5.



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STACKABLE CHAIR

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Continuation of application Ser. No. 853,412, Nov. 16, 1959. This application Sept. 16, 1965, Ser. No. 487,818

5 Claims. (Cl. 297—239)

This application is a continuation of my co-pending application 853,412, filed November 16, 1959, and now abandoned.

My inventioin relates to seating equipment and includes among its objects and advantages, increased comfort for the individual occupant; convenient and effective stacking in small space without folding the chairs; and convenient assembly in transverse rows with effective rigidity, or free for pivotal adjustment.

Further objects and advantages of the invention will become apparent as the description proceeds.

In the drawings:

FIG. 1 is a top view of a chair including the novel features of invention.

FIG. 2 is a front elevation of the same chair.

FIG. 3 is a partial section on line 3—3 of FIG. 1.

FIG. 4 is a fragmentary enlargement of part of FIG. 3.

FIG. 5 is a fragmentary view of the interengaged corresponding legs of two stacked chairs.

FIG. 6 is a fragmentary detail view of the leg portions of two connected chairs as viewed from the plane indicated at 6—6 in FIG. 3.

FIG. 7 is a detail on line 7—7 of FIG. 6.

In the embodiment selected to illustrate the invention, the seat **10** and back **12** are one integral piece of Fiberglas. The back is illustrated with an aperture **14** for coolness. As best indicated in FIG. 3, the seat **10** has four bosses **16** in which are embedded the heads of studs **18**. Each stud receives first, a thick rubber washer **20**; then the end of a steel strap **22**; then a lock washer **24**; and finally a fastening nut **26**.

The straps **22** are welded at **28** near their front ends to the cross piece **30** of the front leg unit and again at **32** near their rear ends to the cross piece **34** of the rear leg unit. The front cross piece **30** has a curved portion **36** at each end, and continues integrally in the front legs **38**. The rear cross piece **34** carries substantially identical legs **40**.

Referring now to FIGS. 3 and 4, each front leg **38** is braced to the rear leg **40** on the same side by a tension brace **42** located about one-third of the way down from the strap **22** to the floor level at **44**. It will be apparent that the two side braces **42**, and the top straps **22**, unite the two leg units into a complete and substantially rigid metal frame of ample strength to carry the weight of the occupant. Furthermore, the back member **12** has a fairly low flat top at **46** and the combined resilience of the frame is such that when an adult of normal weight, who may have been leaning forward a little, lets the torso fall back suddenly against the back, the back can yield from ¼ to ½" under the impact and there is not the abrupt shock that customarily results from such a maneuver. The resilience necessary to accomplish this may be about 10% in the steel frame up to the washers **20** and about 80% in the washers and about 10% in the material of the back and seat. Whatever the distribution may be, this slight cushioning action is a definite comfort to the user and is slightly more effective because the flat portion at **46** leaves the upper edge of the back **12** just below the shoulder blades of the user, where there is a little additional cushioning in the anatomy of the user. It will be obvious that with effective lock washers **24**, it is possible to vary the initial compression on the washers **20**, and adjust the amount of this yielding over a relatively small range that is nevertheless material

in adapting the chair to the needs of the occupant in cases where the same chair is regularly occupied by the same person.

Stacking

While a rigid chair that cannot be folded up can be made much more comfortable for the occupant, the problem of storage becomes a serious one, when a large auditorium is to be provided with chairs and the chairs must be removed from time to time to permit other uses for the floor space. According to the invention, the chairs are all alike and so shaped that one can be superposed on the other, facing in the same direction and only slightly higher up. This involves some care in the contour of the seat and back member. In the common adult size, such a chair as that disclosed can be superposed on an identical chair with the superposed chair only three inches above the chair resting on the floor. This permits a dozen chairs to be successively stacked one upon another, with the total height of the stack only 33" more than the height of the chair resting on the floor.

Each cross brace **42** is a sheet metal plate with its opposite ends wrapped into contact with the associated leg over an arc of about 90° at **50**, and welded to the leg. Each tension brace has a centrally located window **48**, and part of the metal struck out to form this window is bent out of the plane of the body of the brace **42** and toward the center of the chair, being folded back at **52** and then curved through about 120° of arc to define a trough **54**, which rides directly on the leg of the chair below. The spacing of the trough **54** is such that each chair is held three inches above the chair below. The inner contact surface of the trough **54** is faced with a thin layer of suitable contact material **55**, such as felt adhered to the metal, or a thin layer vinyl plastic, or the like.

Referring now to FIGS. 3 and 5, each leg is provided at its lower end with a generally conventional contact foot **56**, but if the foot is made of slightly greater horizontal extent than is customary, it will extend over, as best indicated in FIG. 6, almost or entirely into contact with the lower leg member on the next chair below. The combination of this abutment, and the engagement of the shoes **54** near the top of the side frame structure provides an exceptionally stable stack. However, if the feet **56** are of the relatively small customary size, they will still be quite close to the leg of the chair below, at a point remote from the upper engagement with the shoes **54**, and the deviation from true vertical alignment will still be positively limited to a value small enough so that the stack is entirely satisfactory as well as extremely quiet. If it happens to be jostled, there will be no rattling unless the stack is close to another stack and one stack is pushed against an adjacent stack.

The angularity of the legs is such that upward removal of a superposed chair will not exert undesired lifting force on the chair below. The inclination illustrated has an angle with the vertical having a cotangent of substantially 2.2, and therefore the thrust force pressing the shoe **54** against the supporting leg is 2.2 times the weight carried by the washer **20** at that corner.

Ganging

In many instances, chairs of the type described are used with each chair individually placed, and no mechanical connection between any chair and an adjacent chair. However, it is desirable also to be able to arrange them in parallel rows and keep them in parallel alignment so that the combined assembly of several chairs can approximate the functioning of the conventional pew in a church. Such a ganged row of chairs not only maintains the alignment of all the individual chairs in the row, but because the legs **38** and **40** extend laterally farther than the seat

members **10**, it is possible and convenient to fasten them together in such a way that the suitable transverse spacing commonly employed in permanently assembled theater seats, and the like, can prevail whenever the chairs are ganged. At the same time, there is an open space between each seat and the adjoining seat, and that space is wide enough to permit free circulation of air and reasonable separation between persons of ordinary size occupying the chairs.

Each of the tension braces **42** is desirably stiffened by a full edge roll **58** along its upper edge and a similar roll **60** along its lower edge. Each roll ends diagonally as indicated at **62** in FIG. 6, close to the weld fastening the end of the brace to the adjacent leg. By suitable proportioning, the lateral offset between the side edges of the seat **10** and the plane of the legs, plus the offset between the legs of adjacent chairs that will remain when the rolls **58** and **60** on adjacent chairs are drawn into abutment, as indicated in FIGURE 6, mechanical connection is provided to maintain the desired seat spacing.

To hold the parts in the assembled relationship of FIG. 6, I provide a simple pivoted latch **64** encircling each leg on one side of each chair, and all the chairs have the hooks on the same side, for instance, the left side when looking from the rear toward the front (see FIG. 6). The latch includes the circular portion **66** to guide its movement on the leg which carries it, and the other end has a conventional spring hook **68** adapted to snap over the leg of the adjacent chair into the locked position indicated in FIG. 6. In this condition of assembly, the tension connections **64** at both ends of the tension brace **42** keep the rolls **58** and **60** pressed positively against each other, so that the two chairs will stay in alignment on the floor. It happens also that the size of the enlarged feet **56** may be so dimensioned that these feet will also be substantially in abutment to increase the effectiveness of the lateral connection.

Others may readily adapt the invention for use under various conditions of service by employing one or more of the novel features disclosed, or equivalents thereof. It will, for instance, be obvious that a tension connector having hooks **68** on both ends, could be slipped over the adjacent front legs of two chairs just above the feet **56**, and leave the chairs free to rotate a little for arranging several chairs in circular configuration.

As at present advised, with respect to the scope of my invention, I desire to claim the following subject matter.

I claim:

1. A chair stackable with like chairs and comprising a seat, a supporting frame provided at each side of the chair in positions laterally offset from the seat with a pair of respectively forwardly and rearwardly inclined legs, a generally horizontal brace at each side of the chair directly attached to the legs, each brace having contact members positioned thereon in longitudinally spaced positions adjacent the legs and spaced from said legs to which the brace is attached, said members being connected solely with the brace, independently of either of said legs, and projecting from the brace in positions to engage the upper surfaces of the corresponding legs of a like chair on which the chair aforesaid is stacked.

2. A chair according to claim **1** in which the said members are integral component parts of the brace, each such member being concave in a horizontal plane and having a contour complementary to that of the adjacent leg whereby to embrace the corresponding leg of a like chair.

3. A chair stackable with like chairs and comprising a seat, a supporting frame provided at each side of the chair in positions laterally offset from the seat with a pair of respectively forwardly and rearwardly inclined legs, a generally horizontal brace at each side of the chair directly attached to the legs, each brace having contact members positioned thereon in longitudinally spaced positions adjacent and respectively spaced from the legs to which the brace is attached, each brace comprising a plate having substantial vertical extent and connected to the front and rear legs at the sides thereof in a position offset from the medial plane of such legs and the contact members being lugs struck from the plate and extending therefrom into the plane of the legs.

4. A chair stackable with like chairs and comprising a seat, a supporting frame provided at each side of the chair in positions laterally offset from the seat with a pair of respectively forwardly and rearwardly inclined legs, a generally horizontal brace at each side of the chair directly attached to the legs, each brace having contact members positioned thereon in longitudinally spaced positions adjacent and respectively spaced from the legs to which the brace is attached, each brace comprising a plate having substantial vertical extent and connected to the front and rear legs at the sides thereof in a position offset from the medial plane of such legs and the contact members being lugs struck from the plate and extending therefrom into the plane of the legs, each brace including an outwardly projecting abutment having an extent from the brace equal to approximately one-half of the desired lateral spacing between chairs when the chairs are arranged side by side, and tension members pivoted on the front and rear legs of each chair and having resilient terminal hooks adapted to snap over the legs of an adjacent chair at the lateral spacing determined by said abutment.

5. A chair adapted to be stacked with like chairs and comprising the combination with a seat, of a seat-supporting frame comprising U-shaped forward and rearward members and means connecting such members beneath the seat, the lower ends of the U-shaped members providing at each side of the chair, and in positions laterally offset from the seat, two pairs of legs each including one leg inclined downwardly and rearwardly and another leg inclined downwardly and forwardly, brace plates directly connected to the sides of the legs of the respective pairs, each such plate having an opening intermediate the legs and intermediate its top and bottom margins and further having integral lugs struck from the material of the plate adjacent said openings, said lugs projecting from the respective plates toward the plane in which adjacent portions of the legs connected by the plates are disposed, the lugs being free from such legs and having concave portions directed away from the respective legs and adapted to receive external surfaces of the corresponding legs of a like chair upon which the aforesaid chair is stacked.

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