Sept. 16, 1952 I. R. BROMAGEM 2,610,668

UPLIFT TYPE THEATER CHAIR

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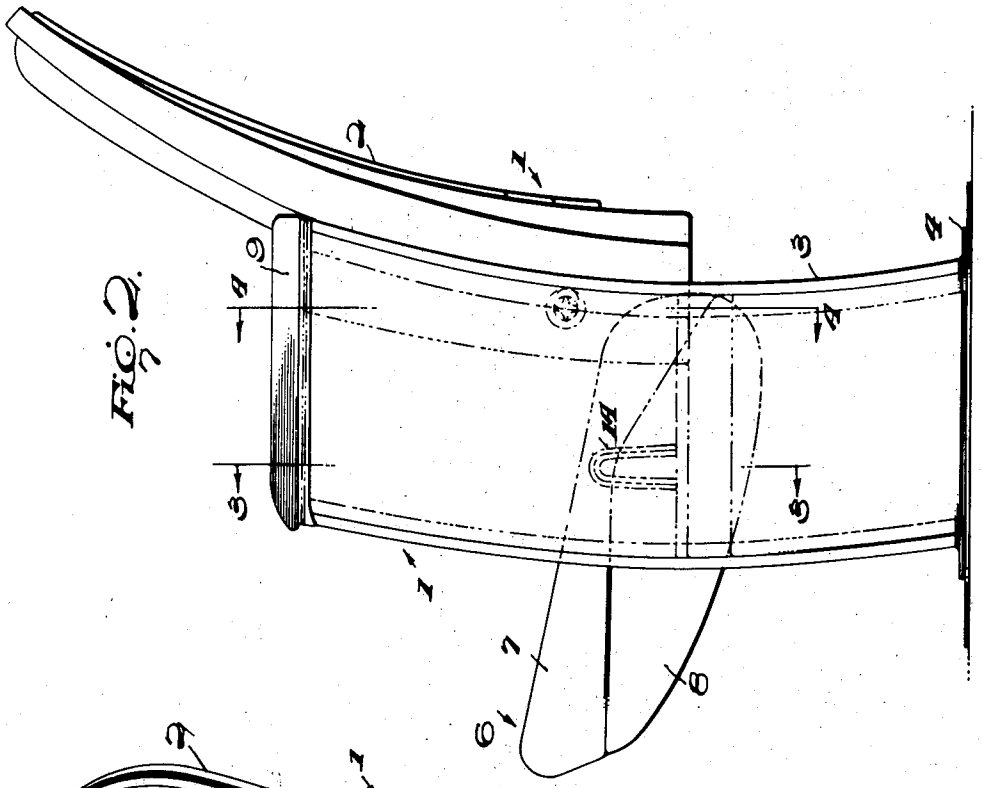


FIG. 2.

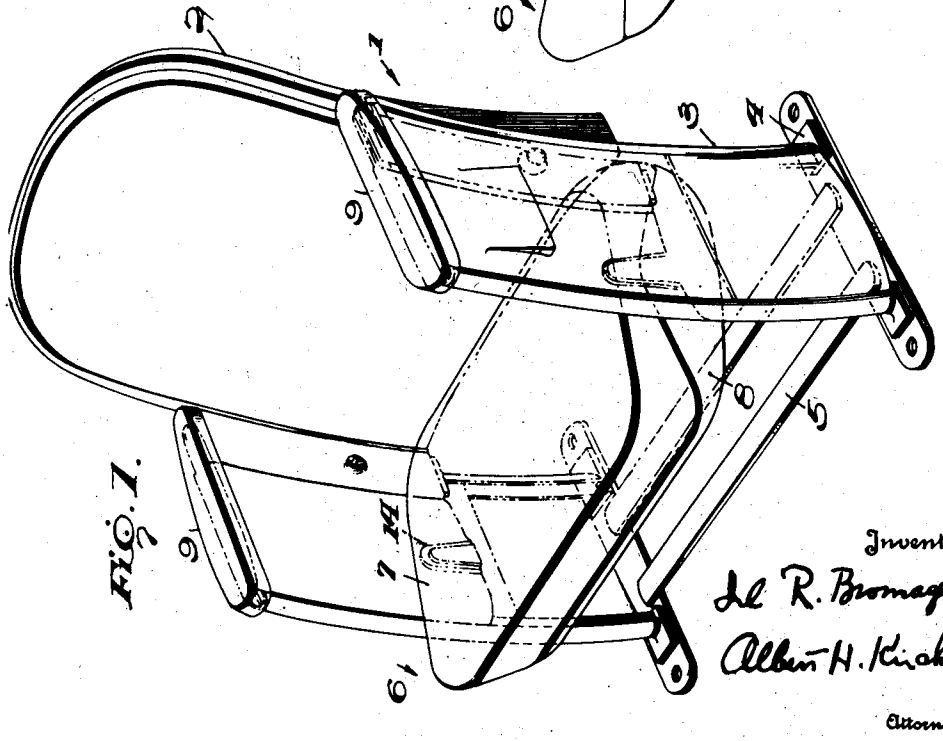


FIG. 1.

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UPLIFT TYPE THEATER CHAIR

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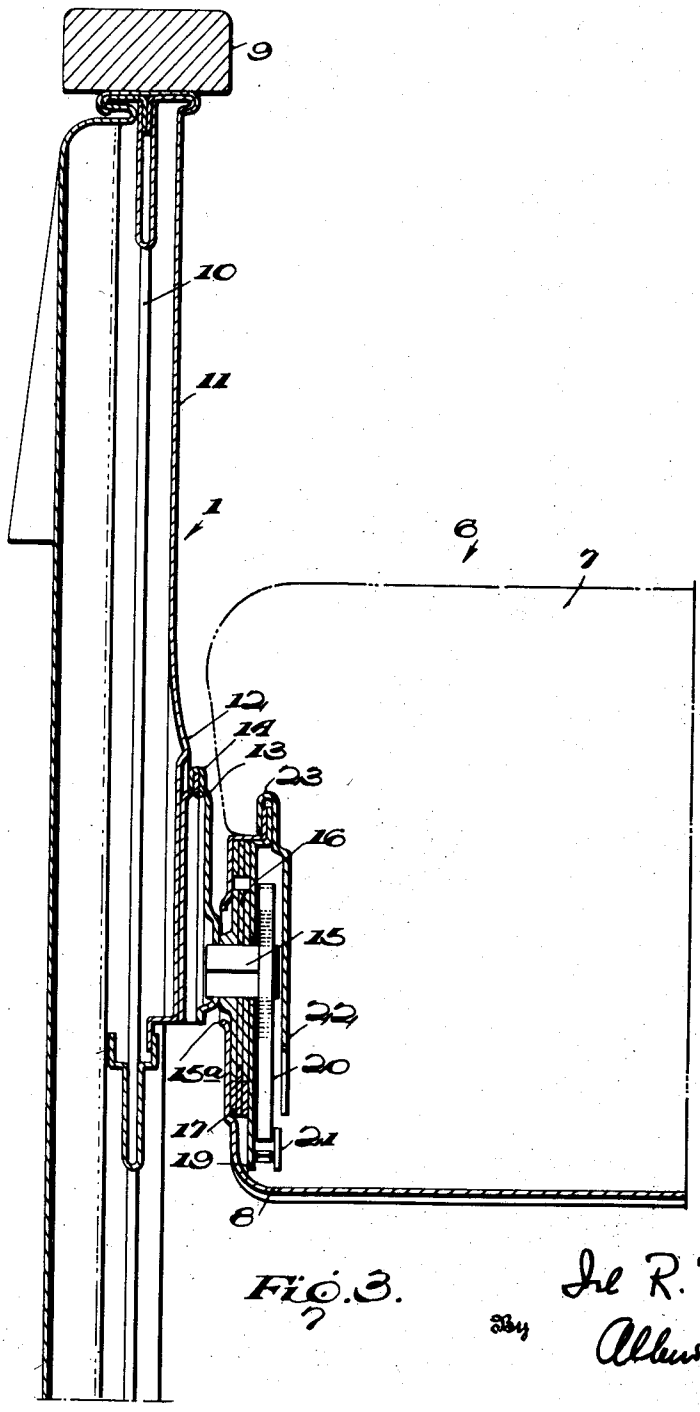


FIG. 3.

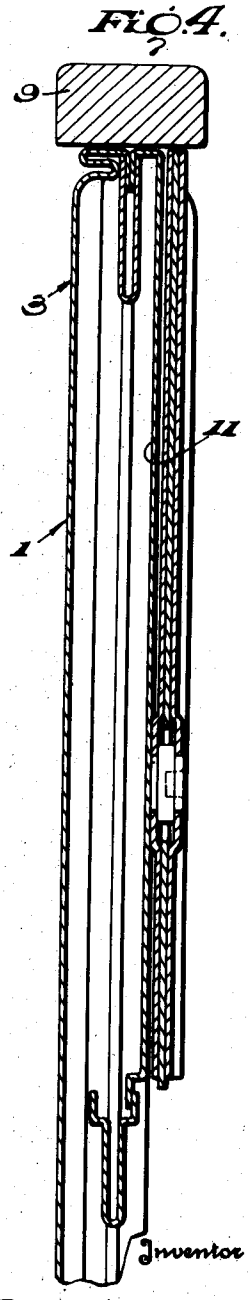


FIG. 4.

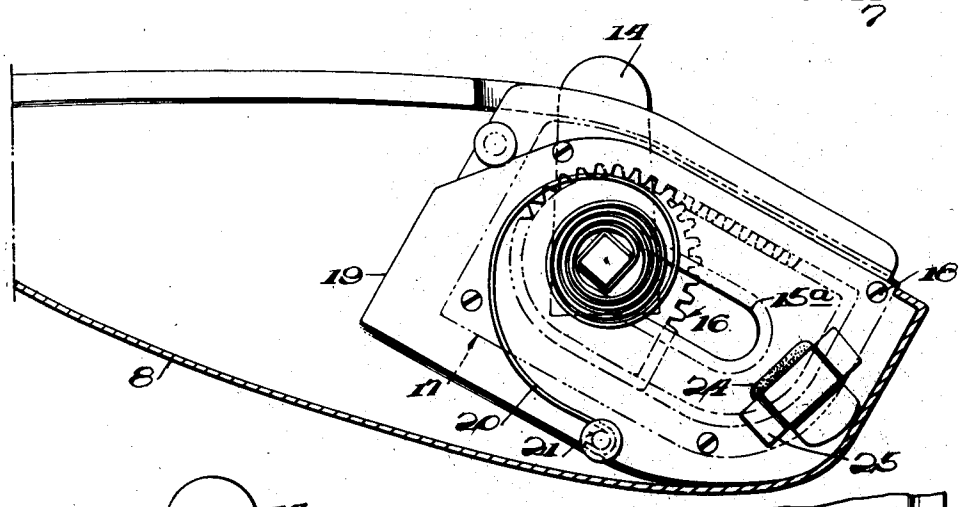
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UPLIFT TYPE THEATER CHAIR

Filed Nov. 25, 1947 3 Sheets-Sheet 3

FIG. 5.



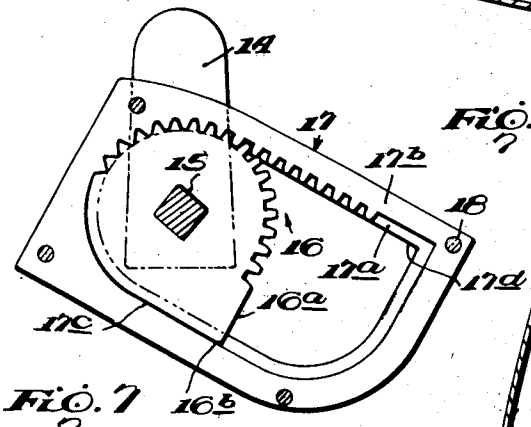
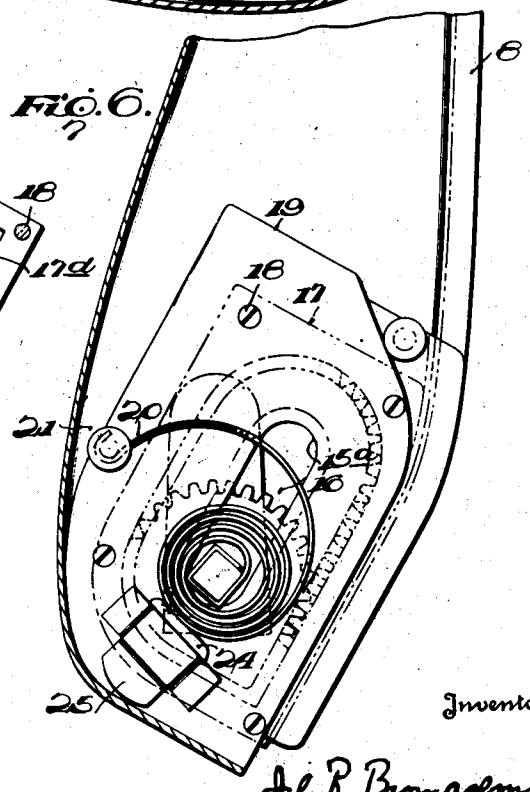


FIG. 7

FIG. 6.



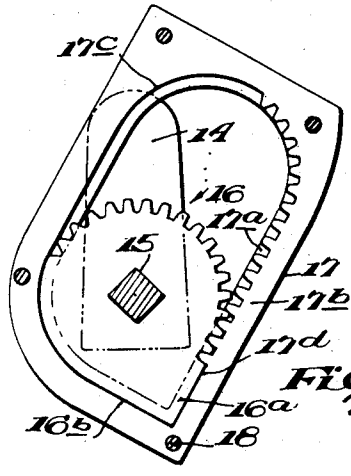


FIG. 8.

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Patented Sept. 16, 1952 2,610,668

UNITED STATES PATENT OFFICE

2,610,668

UPLIFT TYPE THEATER CHAIR

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Application November 25, 1947, Serial No. 787,996

8 Claims. (Cl. 155—85)

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The present invention relates to theater chairs and more particularly to theater chairs of the uplift type.

Such chairs include fixed supporting members, generally in the form of side standards fixed in position on the floor and arranged in pairs with interposed backs, to serve as mounting means for seat members which are pivoted to the standards so as to be movable by swinging from a horizontal operative position to a vertical inoperative position. This swinging movement may be influenced by spring means or the like to cause the seat member to swing up automatically whenever it is not pushed down or held down by an occupant, or the movement may be non-automatic, requiring manipulation by the user to swing the seat member up as well as down. In either type of construction the purpose of pivotally mounting the seat member is to provide for retracting it, whenever desired, to a position occupying less horizontal space in a rear-to-front direction so as to afford increased room between the chair and the chairs of another row of seats in front of it for the convenience of persons moving between the rows to and from the seats.

It has been common in the art to mount the seat members on the side standards by an essentially simple pivot coupling located as near as practicable to the rear edge of the seat member so that this rear edge will be positioned as high as possible with relation to the bottom edge of the seat back when the seat member is in raised position, in order that as little as possible of the top surface of the seat member, which is generally upholstered, will be exposed below the bottom edge of the back for damage by rubbing contact from the shoes of a person occupying a seat in the row immediately to the rear. Because it is not desirable to make the seat backs extend down in close juxtaposition to the floor, and because the structure is mechanically weakened if the pivot axis is positioned very close to the rear edge of the seat member, it has been considered impossible to avoid having the extreme rear zone of the top surface of the elevated seat member completely protected by the lower zone of the back member, and the result has been soiling and undue wearing of the unprotected edge of the seat member by persons occupying seats in the row immediately to the rear.

The primary object of the present invention is to provide a pivotal mounting for seat members in supporting members which will cause the upwardly swinging seat member to rise bodily an appreciable distance relatively to the supporting member so as to bring the seat member into the protection of the supporting member.

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Further objects are to provide such mechanism in simple, inexpensive, durable, foolproof and noiselessly operating form.

Other objects and advantages will be apparent to those skilled in the art from the present disclosure of a preferred embodiment of the invention.

Generally speaking, these objects are accomplished by mounting the seat member on its supporting member by a connection providing pivot and bearing elements carried respectively by the members and so coupled that, when the seat member is swung from horizontal operative position to vertical inoperative position, the elements will become relatively displaced in such a way that the seat member will be bodily lifted. It is convenient to arrange the mechanism so that one of the elements, preferably the pivot element, remains fixed and the other element, preferably the bearing, moves, but within the broad principles of the invention both elements might be arranged to move or the bearing element might be kept fixed and the pivot element mounted for movement, provided that in any case the elements become displaced relatively to each other as the seat member is swung upwardly with a resulting bodily rise of the seat member in relation to the support.

It is also convenient to mount the pivot element on the supporting member and the bearing element on the seat member, but within the broad principles of the invention the arrangement might be reversed, with the pivot element mounted on the seat member and the bearing element mounted on the supporting member, provided that in any case the elements become displaced relatively to each other as the seat member is swung upwardly with a resulting bodily rise of the seat member in relation to the support.

With the foregoing broad principles of the invention in mind, the particular embodiment which is shown in the accompanying drawings and which has been thoroughly tested in actual practice and found entirely satisfactory, and which is accordingly preferred, will now be described.

In the drawings,

Figure 1 is a perspective view of a complete chair embodying the principles of the invention;

Fig. 2 is a side elevational view of such a chair;

Fig. 3 is a vertical cross-sectional view taken through one of the side standards and the adjacent portions of the seat member along the line 3—3 of Fig. 2.

Fig. 4 is a cross-sectional view taken through one of the side standards along a plane rearwardly of the section line of Fig. 3, on the line 4—4 of Fig. 2;

Fig. 5 is a vertical longitudinal view taken

through the seat member showing the seat member in horizontal operative position;

Fig. 6 is a similar sectional view showing the seat member in vertical inoperative position;

Fig. 7 is a detail vertical sectional view showing portions of the pivot and bearing elements in the positions which they assume when the seat is in horizontal operative position; and

Fig. 8 is a similar view showing portions of the pivot and bearing elements in the positions which they assume when the seat member is in vertical inoperative position.

The illustrated embodiment of the invention includes a supporting member 1 having a back portion 2 rigidly held by and between side standards 3 provided with feet 4 which may or may not be connected by cross braces 5 and which are intended to be securely affixed to the floor. The supporting member mounts a seat member 6 which comprises an upholstered top 7 secured to a bottom pan 8 which is best made of sheet metal and which encloses the usual upholstery springs, webbing, filling, etc.

Although shown in the drawing as a single independent unit, in actual practice the chairs are preferably arranged in multiple in a row, with each of the side standards 3, except those at the extreme ends of the row, providing mounting for a pair of seat members, one on each side of each side standard.

The side standards, although shown in this application as of special construction providing for ready removability of the back 2 in accordance with an invention which forms the subject of my separate, co-pending application, may for the purposes of the present invention be of any generally well known construction. Each includes a frame best made principally of metal, surmounted by an arm rest 9 and including interior relatively heavy framing structure 10 faced by an inner trimming plate 11 of sheet metal or the like supported by the frame. The plate 11 is specially formed near its lower portion to provide a slightly inwardly projecting bulge, as shown at 12 with which may be integrally formed, or to which may be rigidly attached as by welding or the like, an upstanding tongue 13 which is downwardly flared from front to rear, or upwardly tapered, and which stands inwardly, with some spacing around its edges, from the plate 11.

The pan 8 of the seat member is provided with a heavy sheet metal socket element 14 which has its marginal edges turned inwardly to form a cavity complemental in shape to that of the tongue 13. This socket member consequently is adapted to fit down onto the tongue and form therewith a rigid connection. It has a short stout shaft or post 15 welded to its lower portion and projecting fixedly therefrom in an inward horizontal direction, passing freely through a lengthwise slot 15*a* formed generally horizontally in the side wall of the pan 8.

It will be appreciated that the arrangement thus far described constitutes a post projecting in fixed relation inwardly from each side of the supporting member 1, through a slot in the seat member 2. The preferred embodiment of the invention comprises mounting a fixed pivot element on the inner end of this post and supporting the pivot element in a bearing mounted on the seat member, so that when the members are connected by interfit of the posts 13 and 14 the pivot element is carried by the supporting member and the bearing element is carried by the seat member.

In the illustrated embodiment the pivot element is a gear 16, and the bearing element is a rack element 17. Each is of special shape and construction as will presently be described.

However, it is appropriate to explain at this point that the rack element 17 is secured inside the seat member by screws or the like 18 which stand through the side wall of the pan and into an inside cover plate 19, with the rack member 17 enclosed in the space between the cover plate and the pan wall.

The rack element is a composite member made of three flat plates, all having registering elongated generally oblong openings and with the opening in the center plate slightly smaller than the openings in the two side plates, so that the periphery of the opening in the center plate, designated 17*a* in Fig. 7, forms an inwardly projecting rib between the two side plates, one of which is shown in Fig. 7, designated 17*b*. The gear 16 is somewhat similarly made of three matching discs, with the center disc having its periphery spaced radially inwardly from the peripheries of the two outer discs. The two outer plates of both the rack and gear elements are provided with teeth around portions of their respective peripheries, as will be presently described, and they are meshed together, as shown in Fig. 3 and Figs. 5–8, in such a way that the rib provided by the rack element center plate 17*a*, which is untoothed, stands between the two outer plates which form the gear element, being interposed between the teeth of the two outer plates of the gear element, thus keying the two elements together and preventing their becoming separated by relative movement in an axial direction.

The gear element is of the shape which best appears in Figs. 7 and 8, having a circular, toothed periphery around substantially 180° of its edge, and having a projecting nose formed by the surfaces 16*a* and 16*b* which are tangent to the circular edge and intersect at approximately a right angle.

The opening in the rack element 17 is completely enclosed by the margins of the plates which form the element and it is of the shape best shown in Figs. 7 and 8, having substantially parallel long sides, one of which is provided with teeth and the other of which is untoothed, and these long sides are connected by relatively short ends, one of which is partially toothed and the other of which is untoothed, as shown in the figures. The opening is provided with substantially straight untoothed portions 17*c* in the straight untoothed portion at one side of the opening and 17*d* diagonally opposite, at the end of the straight toothed portion.

Attention is invited to the special, pointed shape of the teeth in the curved short end of the rack opening, and of those of the gear teeth which mesh therewith, as shown in Figs. 5–8. This special shaping is required for intermeshing, as will be evident from the figures.

The rack element is fastened in the seat member in such a position that the seat member will be disposed in substantially horizontal operative position when the meshed rack and gear elements are related as shown in Figs. 5 and 7, with the surface 16*b* of the gear element stopped against the surface 17*c* of the rack element. It will be obvious that when the seat member is rotated clockwise from its Figs. 5 and 7 position to its Figs. 6 and 8 position, to tilt the seat upwardly to vertical inoperative position, the rack element

will turn with the seat member until it is stopped by engagement of its portion 17*d* with the portion 16*a* of the gear element, thus limiting further turning and establishing a fixed terminal position for the seat member. It will also be evident that during this turning movement the seat member will be bodily raised by the movement of the rack element up the gear element, this bodily rising of the seat member resulting from the fact that the rack element is fixed to the seat member while the gear element is fixed to the supporting member. The extent of bodily rise of the seat member is indicated in Figs. 5 and 6 by the amount of the slot opening 15*a* below the axis of the post 15 in Fig. 5 and the amount above the axis in Fig. 6. This amplitude of rise of the seat member can be, and according to the principles of the invention is, made of such value and amount to cause the uptilted seat member to have its rear edge retracted sufficiently up in front of the seat back 2 to be well protected thereby, thus accomplishing the principal object of the invention.

If it be desired to make uplifting of the seat member automatic when load thereon is removed, spring means may be included for this purpose. As shown in the illustrated embodiment of the invention, a flat, non-volute, non-spiral coil spring 20 has one end fastened to the inner end of the post 15 and its other end secured around a headed pin 21 projecting inwardly from the cover plate 19. The spring is stressed to urge the seat member always to elevated position.

The entire mechanism, including the spring 20, may be covered by the wall of an inner trimming element which I find it convenient to make in duplex form, with two portions 22, one for each side of the seat pan 8, connected by a rear plate portion, which is disposed across the rear inner surface of the pan and can be used to assist in holding the upholstered top 7 of the seat member in place on the pan. Each portion 22 may have its top edge outwardly and downwardly turned, as shown at 23, to fit over the juxtaposed top edges of the plates 19 and the side wall of the pan 8.

If desired or thought necessary, a cushion 24 of rubber or other resilient material may be mounted in a clip or the like 25 on the plate 19 for yieldably stopping the spring 20 when the seat member rises to its upper terminal position, so as to reduce strain on the parts and eliminate noise when the seat member is released to swing free to its upper terminal position. No such cushion is needed at the lowered terminal position of the seat member, since the seat member moves to this position against the stress of the spring 20.

It will be recognized that the construction described hereinabove comprises a pivot element 16 projecting in fixed relation from the supporting member 1 and carried in a bearing element 17 which is fixed in the seat member 6, and that the relationship of the two elements is such that the movement of the bearing-containing member about the pivot-containing member is a compound one, including swinging or pivotal movement and including also translation in a generally vertical direction so that the bearing-containing member rises bodily as it swings from horizontal to vertical position and becomes bodily lowered as it swings from vertical to horizontal position.

Although the mounting of the seat member on the fixed support member is effected by relatively moving pivot and bearing elements which are fixed to the respective members, by means preventing separation of the elements, e. g., the interlock of the multiple-plate gear with the multiple-plate rack, the arrangement is such that the seat member can readily be removed from the support member for quick replacement of a worn or broken seat member. This, of course, is made possible by mounting one of the elements on one of the members, e. g., the pivot element on the support member, by the tongues and socket connection 13, 14, which requires only a forcible lifting of the seat member to separate it, together with the post 15 and the socket 14, from the side standards.

While invention and patentable novelty are claimed for the principal details of the particular construction in which I prefer to embody the broad principles of the invention, these broad principles may be embodied differently, so that the specific features of the illustrated and described construction, while regarded as patentable in themselves, are entitled to a wide range of equivalents, as suggested hereinabove and as will be evident to those skilled in the art. The appended claims are intended to point out the broadly new and patentable principles, as well as the specifically new and patentable details.

I claim:

1. In a theater chair having a fixed supporting member and a seat member pivotally mounted thereon for movement between a horizontal operative position and a vertical inoperative position, mechanism for causing the seat member to rise bodily as the seat member is swung from horizontal to vertical position comprising horizontal pivot means projecting from one of the members and carrying a toothed element, and a correspondingly toothed element mounted on the other member and bearing on the pivot means by engagement thereof with the first-named toothed element so that the seat member may be swung between the named positions, said toothed elements being so shaped that at least one of said elements will become displaced relatively to the supporting member when the seat member is swung from horizontal to vertical position so as to cause the seat member to rise bodily with relation to the supporting member.

2. In a theater chair having a fixed supporting member and a seat member pivotally mounted thereon for movement between a horizontal operative position and a vertical inoperative position, mechanism for causing the seat member to rise bodily as the seat member is swung from horizontal to vertical position comprising horizontal pivot means projecting in fixed relation from the supporting member and carrying a toothed element, and a correspondingly toothed element mounted in fixed relation on the seat member, said toothed elements being engaged with each other and so shaped as to cause the seat member to rise with relation to the pivot means when the seat member is swung from horizontal to vertical position.

3. In a theater chair having a fixed supporting member and a seat member pivotally mounted thereon for movement between a horizontal operative position and a vertical inoperative position, mechanism for causing the seat member to rise bodily as the seat member is swung from horizontal to vertical position comprising a horizontal post projecting in fixed relation from one of the members and penetrating a slot in the other member, a gear element fixed on the end of the post within the slotted member, a rack

element fixed within the slotted member and meshed with the gear element, and abutments fixed with relation to the elements to limit the lengthwise movement of the rack element relatively to the gear element as the seat member is swung between horizontal and vertical positions.

4. In a theater chair having a fixed support and a seat member pivotally mounted thereon, mechanism for causing the seat member to rise bodily as the seat member is swung from horizontal operative position to vertical inoperative position comprising a horizontal post projecting in fixed relation from the fixed support and penetrating a slot in the seat member, a gear element fixed on the end of the post within the seat member, a rack element fixed inside the seat member and meshed with the gear element, and abutments formed on the elements to limit the lengthwise movement of the rack element relatively to the axis of the post as the seat member is swung between horizontal and vertical positions.

5. In a theater chair having a fixed support and a seat member pivotally mounted thereon, mechanism for causing the seat member to rise bodily as the seat member is swung from a horizontal operative terminal position to a vertical inoperative terminal position comprising a horizontal post projecting in fixed relation from the fixed support and penetrating a slot in the seat member, a distorted gear element having toothed and untoothed edge portions fixed on the end of the post within the seat member, and an internal rack element fixed inside the seat member and having toothed and untoothed portions, with its toothed portion meshed with the toothed portion of the gear element, whereby swinging the seat member in either direction to a terminal position will bring the untoothed portions of the elements into engagement and prevent further swinging in said direction, and whereby swinging the seat member to vertical position will cause the seat member to rise bodily as the toothed portion of the rack element rises on the toothed portion of the gear element.

6. In a theater chair having a fixed support and a seat member pivotally mounted thereon, mechanism for causing the seat member to rise bodily while swinging from a horizontal operative terminal position to a vertical inoperative terminal position comprising a horizontal post projecting in fixed relation from the fixed support and penetrating a slot in the seat member, a gear element having a circularly curved edge portion provided with teeth and two straight line edge portions tangent to said circularly curved edge portion and intersecting in an angle, said gear element being fixed on the end of the post within the seat member, and an internal rack element fixed inside the seat member and having a straight line toothed portion merging at its opposite ends into a circularly curved toothed portion and a straight line untoothed portion, said latter portion being continued, through a portion making therewith an angle equal to the first named angle, and through successive curved, straight line and curved untoothed portions, to merge with the curved toothed portion of the rack element, the toothed portions of the two elements being meshed together, whereby swinging the seat member in either direction to a terminal position will bring the untoothed portions of the elements into engagement with each other and prevent further swinging in said direction, and whereby swinging the seat member to vertical position will cause the seat member to rise bodily as the toothed portion of the rack element rises on the toothed portion of the gear element.

7. In a theater chair having a fixed support and a seat member pivotally mounted thereon, mechanism for causing the seat member to rise bodily while swinging from a horizontal operative terminal position to a vertical inoperative terminal position comprising a horizontal post projecting in fixed relation from the fixed support and penetrating a slot in the seat member, a gear element having a curved edge portion provided with teeth along a portion thereof and two straight line edge portions tangent to the curved edge portion and intersecting in an angle, said gear element being fixed on the end of the post within the seat member, and an internal rack element fixed inside the seat member and comprising a plate having an elongated opening defined by two opposite straight line side edges and connecting end edges, one connecting end edge having a straight line portion, one of said side edges being toothed and the other side edge and said end edge being untoothed and, the toothed portions of the two elements being meshed together, whereby swinging the seat member in either direction to a terminal position will bring the untoothed portions of the elements into engagement with each other to prevent further swinging in said direction, and whereby swinging the seat member to vertical position will cause the seat member to rise bodily as the toothed portion of the rack element rises on the toothed portion of the gear element.

8. In a theater chair having a fixed support and a seat member pivotally mounted thereon, mechanism for causing the seat member to rise bodily while swinging from a horizontal operative terminal position to a vertical inoperative terminal position comprising a horizontal post projecting in fixed relation from the fixed support and penetrating a slot in the seat member, a gear element having a curved edge portion provided along a portion of its length with teeth and projecting straight untoothed portions, said gear element being fixed on the end of the post within the seat member, and a rack element fixed inside the seat member and comprising plate means having a toothed straight portion and having two untoothed straight portions, the toothed portions of the two elements being meshed together, whereby swinging the seat member in either direction to a terminal position will bring one of the untoothed portions of the rack element into engagement with one of the untoothed portions of the gear element to prevent further swinging in said direction and whereby swinging the seat member to vertical position will cause the seat member to rise bodily as the toothed portion of the rack element rises on the toothed portion of the gear element.

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