

May 21, 1940.

F. E. VAN HOESSEN

2,201,839

REVOLVABLE CAR SEAT CONSTRUCTION

Filed Nov. 19, 1937

4 Sheets-Sheet 1

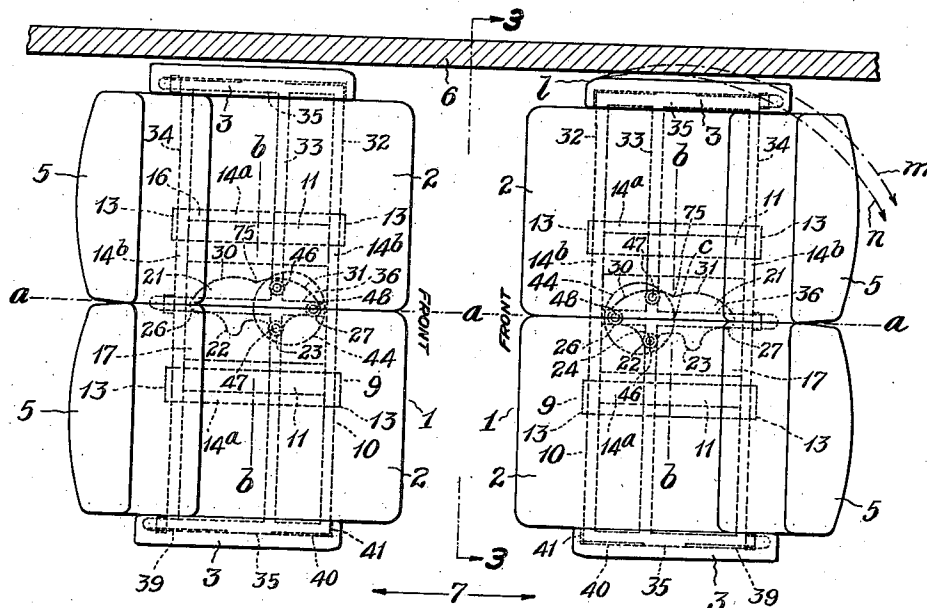


FIG. 1.

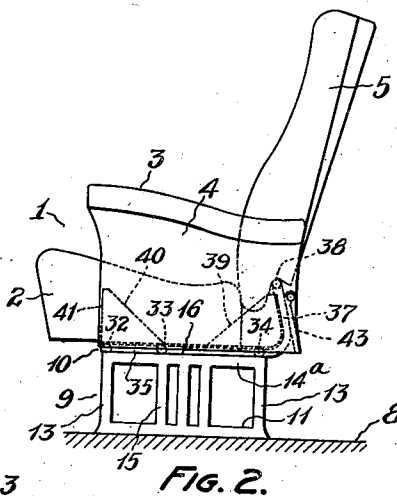


FIG. 2.

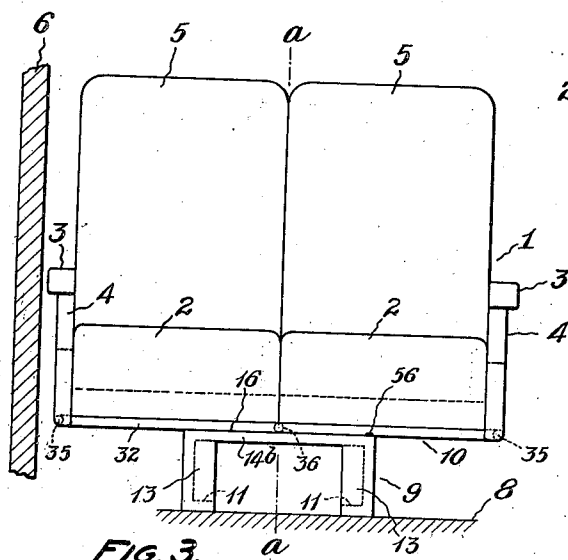


FIG. 3.

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May 21, 1940.

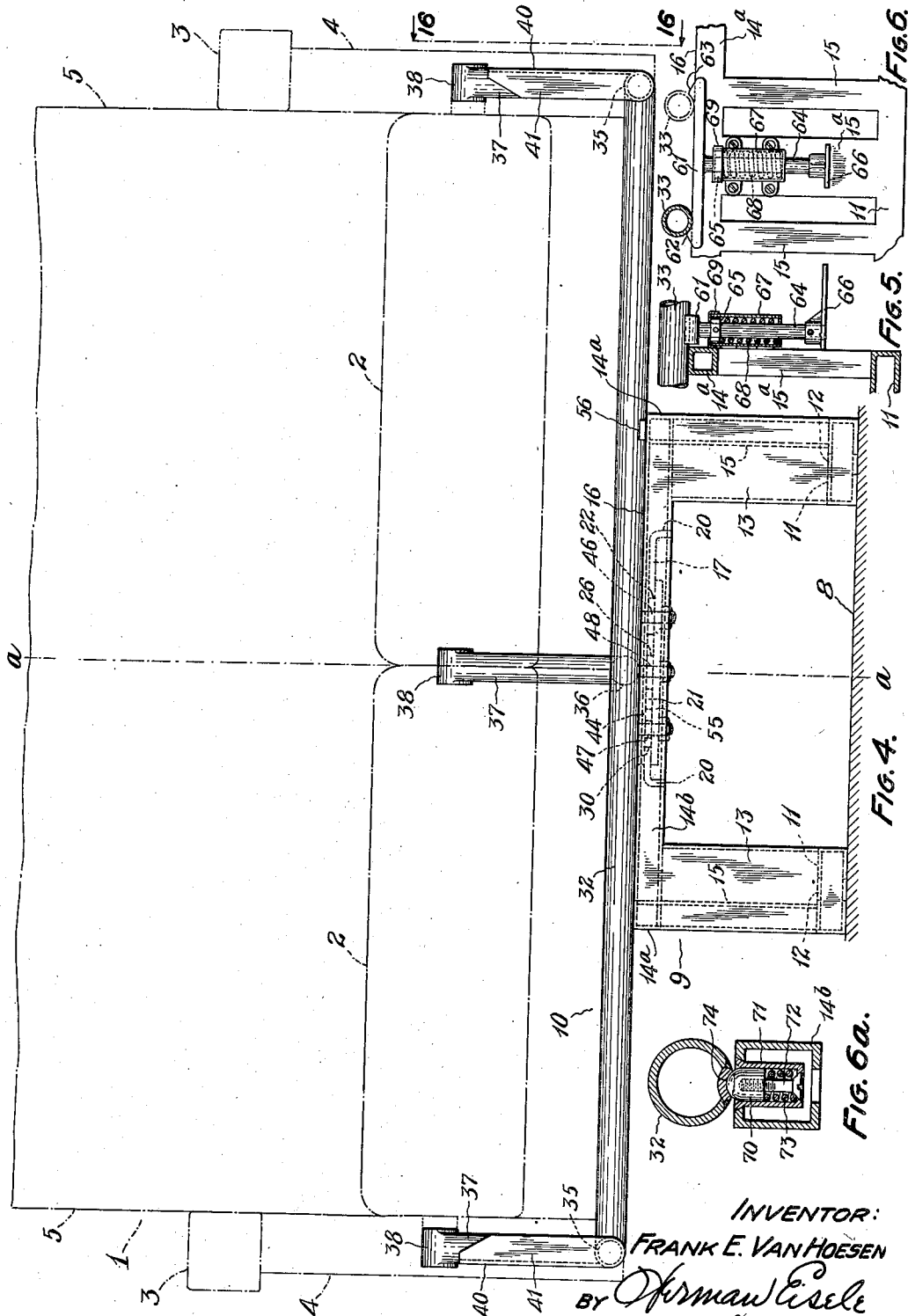
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REVOLVABLE CAR SEAT CONSTRUCTION

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4 Sheets-Sheet 2



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May 21, 1940.

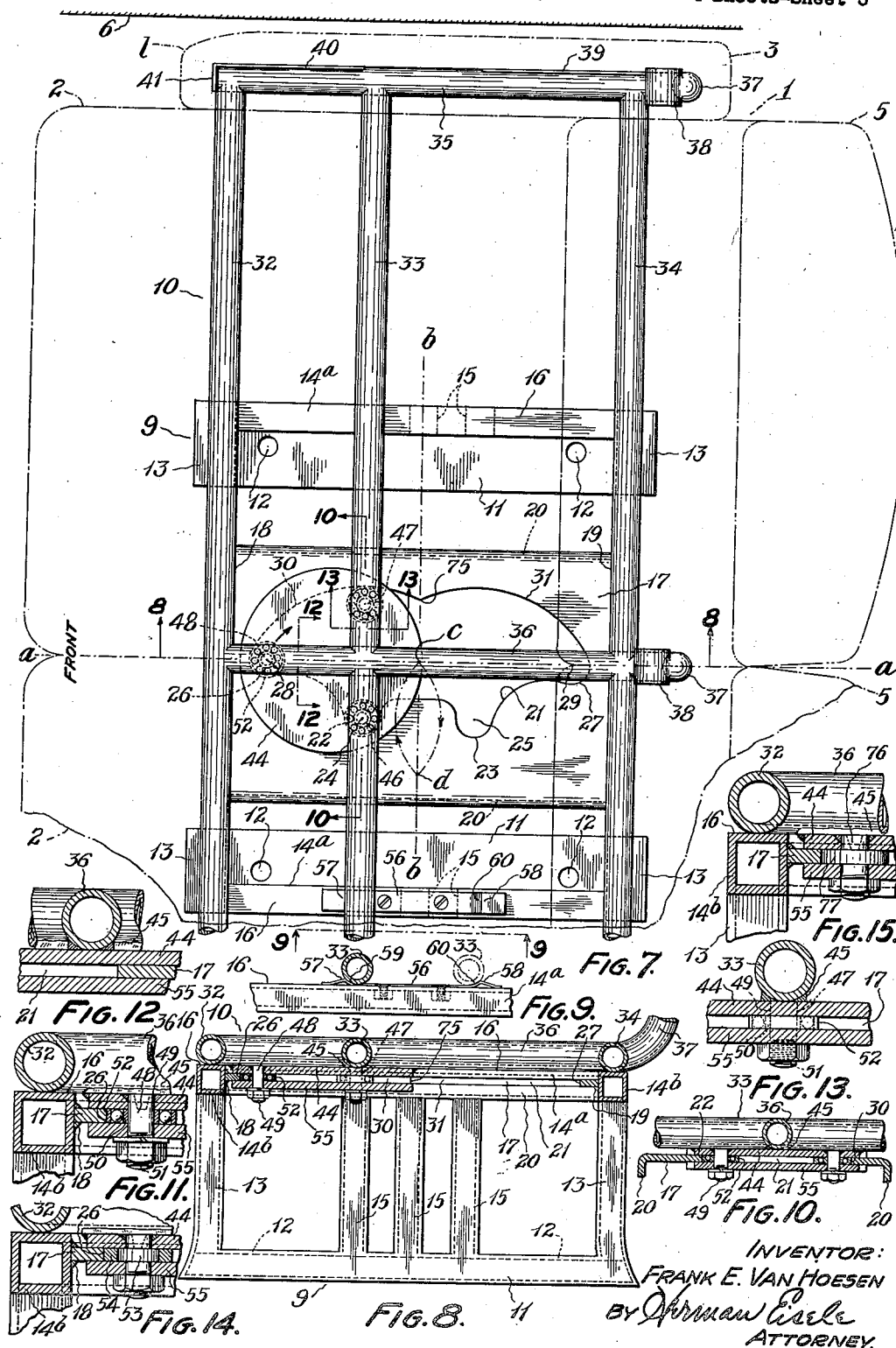
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F. E. VAN HOESSEN

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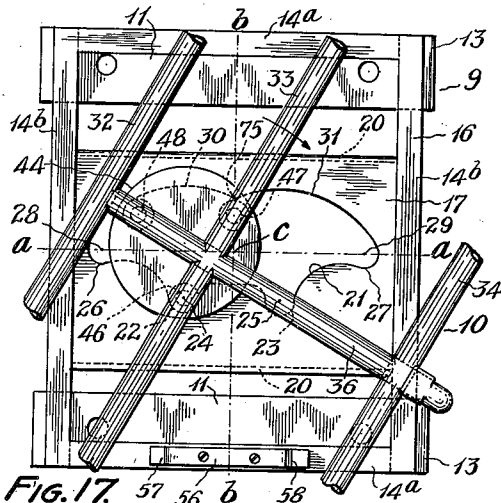


FIG. 17.

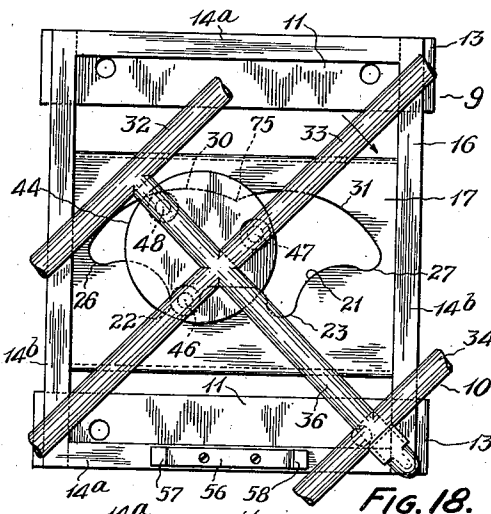


FIG. 18.

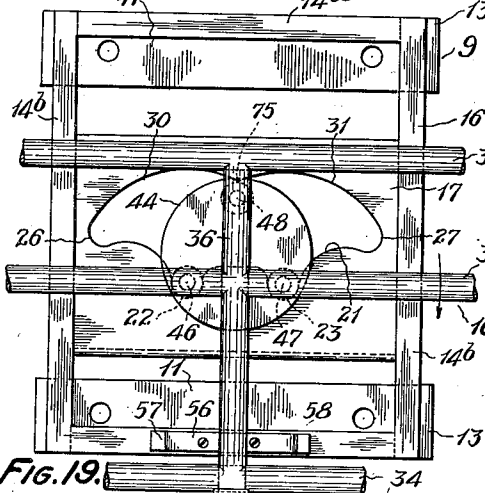


FIG. 19.

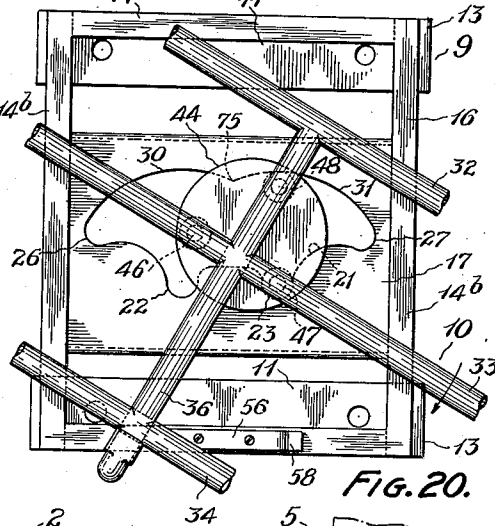


FIG. 20.

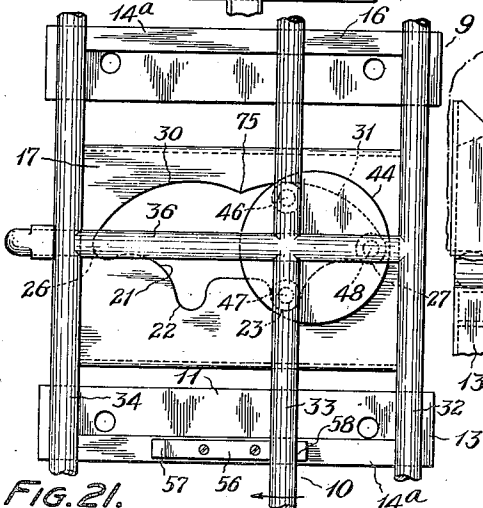


FIG. 21.

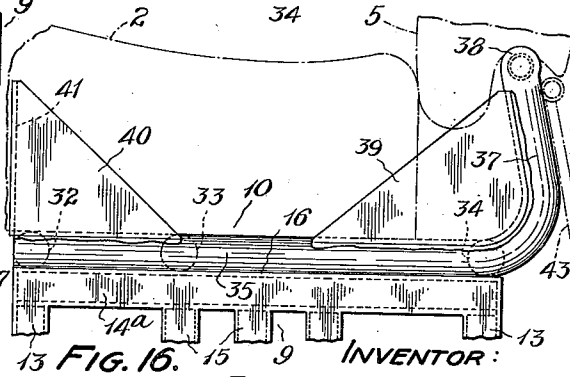


FIG. 16.

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UNITED STATES PATENT OFFICE

2,201,839

REVOLVABLE CAR SEAT CONSTRUCTION

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a corporation of Ohio

Application November 19, 1937, Serial No. 175,454

28 Claims. (Cl. 155—96)

This invention relates to revolvable seats, sometimes known as reversible or rotatable seats, and more particularly to that type of revolvable seat which is optionally turned in a horizontal plane to positions substantially 180 degrees apart, thus adapting the seat to face in either of two directly opposed directions.

In the present disclosure, the invention is described in its application to seats for railway coaches, airplanes, auto busses or other similar uses in which a plurality of seats are placed in rows as closely adjacent each other as the comfort and convenience of the passengers will permit. In the placing of these seats in the conveyances or vehicles referred to, it is further essential that the aisle space be conserved to the utmost, and it is therefore desirable to locate the sides of the seats as closely as possible to the vehicle wall in order to leave the maximum of width of aisle space, when the seats are facing toward either end of the vehicle.

The seats most frequently used in vehicles of the above classes are of the double type and are usually substantially rectangular in outline, as viewed in plan. Consequently when the seat is to be rotated on a vertical axis and the side of the seat is close to the wall, it not possible to rotate the seat about a centrally disposed pivot, for the reason that the corners of the seat and portions of the arm rests would strike the wall. In order to obviate this difficulty, it is necessary to make special provision in the turning mechanism to allow the arm rests and cushion corners to clear the wall and adjacent seats, as the seat rotates.

This present invention discloses improved means for effectively performing the function referred to and accordingly has for one of its objects to provide a seat revolving mechanism for a seat of the type referred to, which will enable the seat to be readily turned in the usual space available without interference with the wall of the car, and without interference with portions of adjacent seats.

It is further an object of this invention to automatically move the center of the seat in a curved path away from the wall during the first half of the revolution of the seat to a point a substantial distance from its point of starting and to move this seat center back to its point of starting in the second half of the revolution of the seat.

It is a further object of this invention to provide a mechanism in which the movement away

from and toward the wall will be effected automatically as the seat is manually rotated.

It is further an object of this invention to provide a mechanism in which the guide for controlling this eccentric movement of the seat resides in a single element and in which there are no moving parts except those moving with the seat when it is rotated.

It is a further object of this invention to provide a revolvable seat construction which is built as lightly as possible compatible with the necessary strength, in order that this seat may be well adapted for use on airplanes and on the modern light type streamline trains.

It is a further object of this invention to provide a revolvable seat construction in which friction and wear are reduced to a minimum and which can accordingly be turned with a minimum of manual effort.

Further objects and advantages of this invention will appear from the following description and from reference to the accompanying drawings. These annexed drawings and description set forth in detail certain means embodying this invention, such disclosed means constituting however, but a few of the forms in which the principles of this invention may be applied.

In said annexed drawings:

Fig. 1 is a plan view showing two of these improved car seats located adjacent the car wall, these seats facing each other.

Fig. 2 is a side elevation of one of the seats shown in Fig. 1.

Fig. 3 is a front elevation of one of the seats illustrated in Fig. 1, this view being taken from the plane indicated by line 3, 3 in Fig. 1.

Fig. 4 is an enlarged front elevation of this improved seat construction, this view showing the seat base structure and the seat supporting frame in full lines and showing the cushions, backs and arm rests in dot and dash lines.

Fig. 5 is a fragmentary axial section showing a modified form of locking mechanism for holding the seat in the desired terminal position, adapted for use with this improved seat base.

Fig. 6 is a side elevation of the modified form of locking mechanism illustrated in Fig. 5.

Fig. 6a is a fragmentary vertical section showing another form of locking mechanism.

Fig. 7 is a fragmentary plan view of this improved seat construction drawn to the same scale as Fig. 4, and showing the seat base structure and seat supporting frame in full lines and showing the cushions, backs, and arm rests in

dot and dash lines, this view showing the positions which the parts occupy in the right hand seat illustrated in Fig. 1.

Fig. 8 is a fragmentary axial section thru the base structure and thru the seat supporting frame, in a longitudinal direction, this view being taken on the plane indicated by line 8, 8 in Fig. 7, certain parts being shown in elevation.

Fig. 9 is a fragmentary view showing the automatic seat locking device used in this improved seat, this view being taken from the plane indicated by line 9, 9 in Fig. 7.

Fig. 10 is a fragmentary transverse section taken on the plane indicated by line 10, 10 in Fig. 7.

Fig. 11 is an enlarged view of a portion of Fig. 8.

Fig. 12 is an enlarged view taken on the plane indicated by line 12, 12 in Fig. 7.

Fig. 13 is an enlarged view taken on the plane indicated by line 13, 13 in Fig. 7.

Fig. 14 is a view similar to Fig. 11 showing a slight modification of the pin unit.

Fig. 15 is another view similar to Fig. 11 showing a further modification of the pin unit.

Fig. 16 is a fragmentary side elevation of this improved seat, this view being taken from the plane indicated by line 16, 16 in Fig. 4, showing the seat supporting frame and the upper portion of the fixed base in full lines and showing fragmentary portions of the cushions and back in dot and dash lines.

Fig. 17 is a fragmentary plan view of this improved seat supporting structure similar to a portion of Fig. 7, but drawn to a somewhat smaller scale, the parts in this view being shown in the position which they occupy after the seat has been revolved thru an angle of about 30 degrees in a clockwise direction from the position shown in Fig. 7.

Fig. 18 is another view similar to Fig. 17 showing the position which the parts occupy after the seat has been revolved thru an angle of approximately 45 degrees in a clockwise direction from the position shown in Fig. 7.

Fig. 19 is another view similar to Fig. 17 showing the position which the parts occupy after the seat has been revolved thru an angle of 90 degrees from the position shown in Fig. 7.

Fig. 20 is another view similar to Fig. 17 showing the position which the parts occupy after the seat has been revolved thru an angle of about 120 degrees from the position shown in Fig. 17.

Fig. 21 is another view similar to Fig. 17 showing the position which the parts occupy when the seat has been revolved thru an angle of 180 degrees from the position shown in Fig. 7, this position corresponding with the position of the parts shown in the left hand seat in Fig. 1.

In this application the term "longitudinal," when used with reference to the seat or its pedestal, is intended to indicate the direction lengthwise of the car or vehicle in which the seat is mounted, and the term "transverse" is intended to indicate a direction transversely of the length of the car.

Referring first to the form of this invention illustrated in Figures 1 to 4 and 7 to 16 inclusive, the seat in which this invention is embodied is a double seat indicated generally at 1, and comprises the usual seat cushions 2, arm rests 3, arm rest supports 4, and backs 5, which are preferably made adjustable by any convenient and well known mechanism, not shown. For convenience of reference, the front of the seat is la-

belled with the legend "Front" in Figures 1 and 7. These seats are as closely spaced longitudinally of the car as the convenience of the passengers will permit and, as clearly shown in Fig. 1, the extreme sides of the seats, that is, the arm rests 3, are disposed closely adjacent the wall 6 of the car. The opposite sides of the seats are located adjacent the aisle indicated generally by the arrows 7, in Fig. 1.

This improved seat is mounted on a fixed base or pedestal indicated generally at 9, rigidly secured to the floor 8 of the car or vehicle, upon which is rotatably and shiftably mounted the seat supporting frame, indicated generally at 10, which in turn supports the cushions, arm rests and backs.

The fixed base structure or pedestal 9 is of substantially rectangular outline in plan and is formed of a pair of hollow rectangular longitudinally disposed floor members 11, four hollow rectangular corner tubes 13, and two top longitudinal square tubes 14a and two top transverse square tubes 14b, these tubes all being secured together to form a rigid base or pedestal. At each side of the base a plurality of square tubes 15 are preferably provided between the floor members 11 and the top tubes 14a, three of these tubes being used on each side in the embodiment disclosed. The tubes of this base are formed with thin walls and are made of steel, aluminum alloy or other suitable material and are preferably secured together by welding.

The floor members 11 of the base are provided with suitably spaced holes 12 for the purpose of securing the base firmly to the vehicle floor. The top square tubes 14a and 14b form a rectangular upper horizontal surface area or section indicated generally at 16 upon which the hereinafter described seat supporting frame 10 rests.

As will appear from the drawings, the seat and seat supporting frames are preferably symmetrical about a longitudinal center line passing thru the center of the seat, this longitudinal center line being indicated by the lines a, a in Figures 1, 3, 4, 7 and 17.

The fixed base or pedestal is likewise symmetrical about a transverse center line b, b passing thru the center of the base.

For purposes of explaining the function of this invention hereinafter reference will be made to the center of the seat. This center of the seat is here defined as a point on the longitudinal center line a, a of the seat above the transverse center line b, b of the seat base, this being the point indicated at c in Figures 1, 7, and 17. It will also be convenient for the sake of clearness to refer to certain parts of the seat supporting structure as located on the "wall side" of the longitudinal center line a, a by which is to be understood, a location between the longitudinal center line a, a and the wall of the car and likewise the expression "aisle side" of the longitudinal center line is intended to indicate a location between the longitudinal center line a, a of the seat and the aisle of the car.

The seat may be regarded as divided into quarters by the center lines a, a and b, b. Considering the "aisle side" the "outside" of the seat, and considering the "wall side" the "inside" of the seat, the quarter bounded by the seat front, the aisle side, and the two center lines may be called the outer forward quarter, and the quarter bounded by the seat rear, the aisle side, and the two center lines may be called the outer rear quarter.

Interiorly of the pedestal and near its top is a horizontal plate 17, the top of this plate being, in the embodiment shown, spaced from the upper surface 16 and being secured at its transverse edges 18 and 19 by welding, to the inner opposed walls of the transversely extending square tubes 14b. The longitudinal edges of the plate 17 are formed with downwardly extending stiffening flanges 26. This horizontal plate 17 is formed with an opening 21 interiorly of its edges. A portion of the marginal edge of this opening is formed with a pair of spaced substantially semi-circular sockets 22 and 23, described about centers 24 and 25, respectively.

It will appear that these centers 24 and 25 are located on the aisle side of the longitudinal center line *a, a* and also that these centers are located on opposite sides of the transverse center line *b, b* and are disposed symmetrically about this transverse center line. In other words, the center 24 is located in the outer forward quarter, and the center 25 is located in the outer rear quarter, of the seat.

Another portion of the marginal edge of the opening 21 is defined by a pair of semi-circular sockets 26 and 27 described about the centers 28 and 29. These centers 28 and 29 are, in the embodiment shown, located on the longitudinal center line *a, a* and symmetrically about the transverse line *b, b*.

The marginal edge of the opening 21 is further defined by a pair of arcuate surfaces 30 and 31, these surfaces being tangential continuations of the semi-circular portions of the sockets 26 and 27 and extending toward the center of the seat and being concentric with the centers 24 and 25 respectively. These arcuate surfaces intersect each other at the transverse center line *b, b*, as indicated at 75. It will be evident that these arcuate surfaces are each continuous and that their effective length is substantially 90 degrees.

The seat supporting frame 10 is constructed of round tubular members suitably secured together and formed with suitable supports for cushions, arm rests, and backs and provided with a novel mechanism adapted to cooperate with the base 9. The transverse members of the seat supporting frame 10 are preferably three in number, and tubular in section, the front tube being indicated at 32, the intermediate tube at 33 and the rear tube at 34. The front and rear tubes are symmetrically disposed about the center line *b, b* and the intermediate tube is located forwardly of this center line as appears in Fig. 7.

Three longitudinal tubes are connected to the transverse tubes 32, 33 and 34 preferably by welding and are disposed in the same plane with the transverse tubes. The two longitudinal side tubes are indicated at 35 and the intermediate or central longitudinal tube is indicated at 36. These longitudinal tubes are formed at the rear ends with an upwardly curved portion 37 terminating in a boss as indicated at 38. This boss is suitably apertured to receive rods or other means for pivotally supporting the backs 5.

Triangularly shaped gusset plates 39 are welded to the rear of the side tubes 35 to form webs to stiffen the upwardly projecting portion 37. A similar triangularly shaped bracket plate 40 is secured, preferably by welding, to the front ends of the side tubes 35. This bracket is formed, at the front, with an inwardly turned flange 41. The plates 39 and 40 form suitable supports for the side walls 4 shown in Figures 2, 3, and 4, which in turn support the arm rests 3. The usual

kick plate 43 is also suitably supported in any desired manner on the portion 37 of the side tubes. The cushions are removably supported directly on top of the tubular supporting frame, as will be understood.

Fixedly secured to the under surfaces of the tubes 33 and 36 is a pin plate 44, this plate being secured to the under face of these round tubes preferably by welding, as shown at 45 in Figures 8, 10, 11, and 12. The bottom of this plate is disposed below the plane of the upper horizontal surface 16 of the pedestal 9, and the bottom of the plate 44 preferably slidably engages the upper surface of the horizontal plate 17.

Fixedly secured in the plate 44 are three vertically disposed downwardly projecting pin units 46, 47, and 48, each unit consisting, as shown in Figures 7, 8, 10, and 11, of a pin element 49, provided with or formed with an enlarged intermediate portion. This enlarged intermediate portion may consist of a collar or inner ball race as shown at 50 in Fig. 11 or this enlarged intermediate portion may be integrally formed with the pin as shown at 53 in Fig. 14.

The upper portion of this pin element is securely fixed in the plate 44 as by expanding and welding as shown in Fig. 11, and the lower end of the pin is formed with a thread as shown at 51 for a purpose to be explained.

Surrounding the enlarged portion 50 of the pin is an anti-friction element 52 such for instance as a ball bearing as shown in Fig. 11, or a roller element 54 as shown in Fig. 14. The outside radius of the anti-friction element 52 or 54 is made preferably the same as the radius of the sockets 22, 23, 26 and 27. It will be noted that the pin units are equally spaced from each other and that the distance from center to center of pin units is identical with the distance between the centers 24 and 25, 24 and 28, 25 and 27.

It will also be apparent that the radius of each of the arcuate surfaces 30 and 31 is equal in length to the center to center distances of these pin units plus the radius of the anti-friction element.

It will also be noted that two of these pins 46 and 47 are located toward the front of the transverse center line *b, b* of the seat and in a plane parallel to the transverse center line and symmetrically located with reference to the longitudinal center line *a, a* and that the third pin is located still farther away from the transverse center line of the seat and closer to the front of the seat and is located upon the center line *a, a*.

The pins 46 and 47 are located immediately below the transverse tube 33 and the pin 48 is located immediately below the longitudinal tube 36. Spaced from the pin plate 44 and mounted upon the pin units 46 and 47 and 48 is a bottom shoulder or cover plate 55 secured in place on the pins by means of nuts engaging the threaded portions 51, the pins in effect forming posts for supporting the cover plate. The shoulders formed by the intermediate enlargements 50 or 53 on the pins hold the plates 44 and 55 in proper spaced relation and are sufficiently greater in height than the thickness of the horizontal plate 17 in order that the under surface of the plate 44 and the upper surface of the plate 55 may be in sliding or shifting engagement with the respective faces of the horizontal plate 17.

Operation

The operation of the above described apparatus

ratus will now be explained with particular reference to Figures 1, 7, and 17 to 21 inclusive.

The right hand view in Fig. 1 and Fig. 7 show the parts of the seat frame and pedestal in a position which may be termed the starting position, the pin unit 46 being located at the pivotal center 24 of the socket 22, the pin unit 48 being located at the pivotal center 28 of the socket 26 and the pin unit 47 engaging the arcuate surface 30 at a point intermediate the ends of that surface, all as best illustrated in Fig. 7.

It is assumed now that it is desired to turn the seat in a clockwise direction as viewed in plan. In this event, the passenger seizes the seat and moves it in a clockwise direction with sufficient force to disengage certain terminal locking mechanism to be hereinafter described. This clockwise rotation of the seat causes the pin unit 48 to move in a clockwise direction as suggested by the short arrow in Fig. 7. This pin unit is constrained to move in an arcuate path concentric about the center 24 by the engagement of the anti-friction element 52 with the arcuate surface 30. At the same time the pin unit 47 likewise moves concentrically about the center 24. The pin unit 47 is thus guided by the arcuate surface 30 until the pin unit 47 passes beyond the point of intersection 75 of the arcuate surfaces 30 and 31, as shown in Fig. 17. Further rotation will cause the pin unit 47 to move without restraint in the opening 21, as appears in Fig. 18.

Continued rotation of the seat causes the pin unit 48, however to continue to travel in an arcuate path concentric with the center 24 until the unit 48 reaches the point of intersection of the arcuate surfaces 30 and 31 at 75 as shown in Fig. 19 at which the pin unit 47 has become seated in the socket 23. It is evident that the pin unit 48 is thus guided by the continuous arcuate path for an angular distance of substantially 90 degrees.

When the parts are in the position shown in Fig. 19 the seat has been turned 90 degrees and the front of the seat is facing the car wall. If it is desired to maintain the seat in this position, suitable locking means may be provided for holding the seat. Ordinarily however it is desired to turn the seat a complete half turn, that is, 180 degrees from the starting position and the clockwise rotation of the seat is continued.

It will be apparent, however, that after the first 90 degrees of rotation of the seat, it is no longer possible for the pin unit 47 to rotate about the center 24 because of the seating of this pin unit 47 in the socket 23. The pin units 48 and 46 however are free to rotate about the center 25 and immediately upon further rotation of the seat from the position of the parts shown in Fig. 19, the pin unit 48 engages and is guided by the arcuate surface 31 concentrically about the center 25, the pin unit 46 having been shifted from its seat in the socket 22 and moving freely in the opening 21. This intermediate position of the parts is indicated in Fig. 20. As it will appear, continued clockwise rotation of the seat causes the pin unit 46 also to engage and be guided by the arcuate surface 31 until the pin unit 48 becomes seated in the socket 27, this position of the parts being indicated in Fig. 21. When this occurs, the seat has been rotated clockwise 180 degrees and is occupying a terminal position directly opposite to the starting position, this opposite position being illustrated by the left hand view in Fig. 1. The seat is locked

in this terminal position preferably by automatic means to be described.

It will be understood that when it is desired to turn the seat back from the position shown in the left hand view in Fig. 1 to the position shown in the right hand view shown in Fig. 1, it is only necessary to rotate the seat in a counterclockwise direction whereupon the operation of the mechanism will be the reverse of that described above, the seat pivoting for the first 90 degrees about the center 25 and pivoting for the second 90 degrees about the center 24.

In view of the rigid connection between the seat frame and the pin units 46, 47 and 48, the movement of these pin units will control the movement of the seat. It will be evident that the pin units due to their continuous engagement with the periphery of the opening 21, rigidly hold the seat against any lateral shifting movement or loose play at all times except such intentional lateral shifting as is effected by the contour of the opening.

The path described by the center *c* of the seat when the seat is turned 180 degrees is indicated by a dot and dash line in Fig. 7 in which the path of the center *c* runs along the dot and dash line as shown by the arrow until the center *c* reaches the position indicated at *d* when the seat has been turned 90 degrees in a clockwise direction, the center returning from *d* to *c* along the line as shown by the arrow when the seat is turned the second 90 degrees.

It is important to note that the center of the seat *c* moves quite directly away from the car wall 6 until the seat has been turned 90 degrees. This substantial lateral or transverse movement of the seat from the car wall serves to provide a maximum of space between the front of the seat and the car wall when the seat is turned 90 degrees of the turning of the seat, the center of the seat, of course, returns quite directly toward the car wall from the point *d* to the point *c*.

The above described construction effects a rapid transverse shifting of the seat away from the wall as the seat is turned, as a result of which the projecting corners of the cushions and arm rests clear the wall in the turning of the seat. This advantage accrues, of course, from the fact that the pivot about which the seat is turned is located on the aisle side of the longitudinal center line thus revolving the cushion corners about a longer radius, that is, thru a flatter arc and also from the fact that the seat is turned about a pivot nearer the front of the seat than the transverse center line, that is, nearer to the cushion corners and nearer the forward end of the arm rests. The advantage gained by this construction as compared with the usual rotation about the center of the seat is shown in connection with the right hand view in Fig. 1, where *m* represents the path which would be described by the projecting corner *l* on the arm rest if the seat were rotated about the center *c*, from which it will appear that the point *l* would intersect the wall a substantial amount, and it would be necessary to move the entire seat away from the wall considerably in order to permit the seat to rotate about its center. The path actually described by the projecting corner *l* on the arm rest with the use of the present invention is represented by the arc *n* in the right hand view in Fig. 1, which easily clears the wall 6 of the car. It will be evident that the use of this invention permits the side of the seat to be placed very closely adjacent the car wall.

It will be understood of course that modifications may be made in the details of construction of this invention which will permit the arm rests to substantially contact the face of the wall.

In reference to the above described operation, it will be understood that the arcuate guides fixed in the base structure are adapted to constrain two of the three pin units to rotate about the third pin unit. It will also be clear that the arcuate guides each comprise an uninterrupted arcuate surface having a length of substantially 90 degrees and that this arcuate surface effectively guides the pin units concentrically about the socket centers, for substantially 90 degrees, independently of any other guiding means. It is also clear that at least one of the pins is guided continuously concentrically about one of the sockets until one other pin is seated in the other socket.

It will also be understood that portions of the rounded tubes of the seat supporting frame engage and disengage the horizontal surface 13 at the top of the pedestal and that this engagement is facilitated by the roundness of the under sides of the tubes which readily slide upon the edges of the flat surface area 16.

It will be apparent, from the above description, that the engagement of the pin unit 43 with the sockets 26 and 27 will prevent further rotation of the seat frame in a counterclockwise or clockwise direction, respectively, and that these engagements of the pin in the socket will locate the seat in the terminal position.

Means for locking the seat in these terminal positions are provided and may take any convenient form such for instance as that shown in Figures 4, 7, and 9, in which an elongated thin spring strip 56 is fixedly secured to one of the upper longitudinal tubes 14a, this spring being formed with a pair of spaced upwardly extending abutments 57 and 58. These abutments 57 and 58 are, on their inner sides, curved to form shoulders fitting the outside of the tube 33 of the seat supporting frame, as shown at 59 and 60. The outer sides of the abutments are sloped gradually downwardly to meet the surface 16.

As will appear from Figures 7 and 9, the engagement of the pin unit 43 in the socket 26 prevents the seat from rotating in a counterclockwise direction and the projection 57 normally prevents the seat from rotating in a clockwise direction and thus the seat is maintained square with the car wall.

When it is desired to rotate the seat, however, it is only necessary to pull the aisle side of the seat in a clockwise direction, whereupon the round bottom of the tube 33 readily rides over the abutment 57 in the strip 56 and the seat is free to rotate substantially 180 degrees. As will appear from Figures 17 to 21, others of the seat frame tubes will ride over the abutments 57 and 58, as the seat supporting frame is rotated 180 degrees from one terminal position to the other. It will be understood that the tube 33 will rest against the shoulder 59 at the abutment 57 when the seat is in the position shown in Fig. 7, corresponding with the right hand view in Fig. 1, and that the tube 33 will rest against the shoulder 60 at the abutment 58 (see Fig. 9) when the seat frame is at its reversed terminal position as in the left hand view in Fig. 1.

A modification of the lock for holding the seat in its terminal position is shown in Figures 5 and 6. This modification includes a horizontal bar 61 formed adjacent its ends with abutments 62

and 63. These abutments form shoulders fitting the outside of the tube 33 and are formed with outwardly and downwardly projecting inclined surfaces beyond the abutments. This bar is integrally formed with a downwardly projecting stem 64 and is provided with an enlargement or collar 65 located adjacent the upper end of the stem but spaced from the bar 61. A foot pedal 66 is secured to the lower end of the stem. The stem 64 is mounted for reciprocation in the casing 67 which is provided with an adjustable cap 69, this casing being secured to a relatively wide vertical tube 15a of the base structure. Interiorly of this casing and surrounding the stem 64 is a helical coil spring 68, the lower end being seated on the bottom of the casing and the upper end engaging the enlargement 65 on the stem, thus yieldingly holding the enlargement against the cap 69 of the casing at a height to effect a proper engagement between the abutments 62 and 63 and the tube 33. It will be apparent that the lock spring 68 causes the abutments to firmly but resiliently hold the tube 33 in its terminal position and that when a suitable lateral force is applied to the tube 33, incident to the turning of the seat, the spring will be slightly compressed by the downward movement of the stem 64 until the tube 33 is released. This modified lock will operate substantially the same as the locking means formed by the spring strip 56 but this lock has the advantage that greater tension may be applied to the abutments in view of the fact that the lock may be released by the action of the foot on the pedal 66.

Another modification of a lock is illustrated in Fig. 6a. This lock comprises a vertical reciprocable plunger 70 having a rounded upper end mounted in a cartridge or casing 71. A pin or screw 72 is secured to and axially aligned with the plunger 70 and is formed with a head projecting downwardly below the cartridge 71 thru an opening in the cartridge base slightly smaller than the head. A spring 73 is enclosed in the cartridge surrounding the screw 72 and having its lower end engaging the cartridge base and having its upper end engaging the under side of the plunger 70. A suitably formed socket 74 adapted to engage the upper end of the plunger 70, is formed in the bottom of one or more of the tubes at the bottom of the seat frame. This simple locking device is preferably located at one of the corners of the fixed base or pedestal, as for instance in the horizontal transverse tube 14b, and the socket 74 is provided in the tubes 32 and 34 and so located as to properly register with the plunger 70 when the seat is in the terminal position. This plunger is very simple in construction, effective in operation and does not adversely affect the outward appearance of the seat base.

Altho the preferred construction of the pin unit includes an antifriction element, such as the ball bearing or roller, such an antifriction element is not indispensable. An integral pin unit has produced very satisfactory results, such unit being illustrated in Fig. 15, in which the pin unit 76 is mounted in the pin plate 44 and is formed with an integral enlargement 77 which occupies relatively the same position as the antifriction elements previously described and which engages the arcuate surfaces 39 and 31 and is guided by them in substantially the same manner as described for the pin units including an antifriction element.

Many other modifications of this invention and its application, in addition to those shown,

will naturally occur to those skilled in this art, and the present disclosures should therefore be considered as typical only and applicant desires not to be limited to the exact construction shown and described, and no unnecessary limitations should be understood therefrom, but the appended claims should be given as broad a construction as permissible in view of the prior art.

What I claim is:

10 1. A revolvable seat, including a fixed base structure, a seat supporting frame rotatably and slidably carried upon said base structure, three downwardly projecting pin units mounted in the seat supporting frame, a pair of spaced sockets provided in said base structure, the first of said sockets being adapted to receive the first of said pin units and the second socket being adapted to receive a second of said pin units, an arcuate surface formed in said base structure concentrically disposed with reference to said first socket and adapted, when the seat frame is rotated, to guide said third pin unit concentrically about said first socket until said second pin is seated in said second socket.

25 2. A revolvable seat adapted to be revolved between terminal positions, including a fixed base structure, a seat frame rotatably and slidably supported upon said base structure, three pin units mounted in the seat frame, a pair of spaced sockets located in the base structure each adapted to receive one of said pin units, a pair of arcuate surfaces provided in the base structure, one concentrically disposed with respect to each of said sockets, said surfaces each being adapted upon the rotation of the seat frame to successively guide one of said pins concentrically about each of said sockets when the seat frame is rotated from one terminal position to another.

3. A revolvable car seat including a base structure, a seat supporting frame rotatably and shiftably carried upon said base structure, three vertically disposed pins spaced equi-distantly from each other and fixedly mounted in the seat supporting frame, two of said pins being transversely aligned in a plane substantially parallel to but laterally spaced from the transverse center line of the base and the third of said pins being disposed laterally of the two aligned pins in a direction away from the transverse center line of the base, and guide means associated with the base structure adapted to constrain said third pin to rotate about one of said aligned pins when the seat frame is rotated.

4. A revolvable seat including a fixed pedestal provided with a substantially flat upper surface and a substantially horizontal plate formed with an opening, a seat frame rotatably and shiftably mounted upon said surface, three pin units equally spaced from each other and fixedly secured to the seat frame and extending into said opening in the horizontal plate, the marginal edges of said opening being formed with arcuate surfaces and sockets adapted to successively revolve one of said pin units about each of the other two pin units when the seat frame is rotated 180 degrees.

5. In a revolvable seat including a fixed pedestal provided with a substantially horizontal plate formed with an opening and a seat frame rotatably and shiftably mounted upon said plate, a plurality of pin units fixedly secured to the seat frame and extending into said opening, the marginal edges of the opening being formed with a pair of spaced sockets each adapted to receive one of said pin units, and a pair of continuous

arcuate surfaces, one concentrically disposed with respect to each of the sockets, said arcuate surfaces intersecting each other and each extending laterally an angular distance of substantially 90 degrees from the point of intersection, said arcuate surfaces being disposed eccentrically with respect to the pedestal and being adapted to guide at least one of said pin units whereby the seat frame is longitudinally shifted when the seat frame is rotated.

6. A revolvable seat including a fixed base structure, a seat frame rotatably and slidably supported upon said base structure, three pin units triangularly arranged and spaced equidistantly from each other mounted in the seat frame, the base structure having a pair of sockets spaced apart a distance equal to the spacing of the pin units and successively receiving two of the pin units, and a pair of arcuate surfaces formed in the base structure for guiding the third pin unit, each such surface being concentrically disposed with respect to one of the sockets, and each such surface extending substantially 60 degrees from a transverse line extending through its socket in a direction away from the opposed socket.

7. A revolvable seat including a fixed base structure, a seat frame rotatably and slidably supported upon said base structure, the base structure having an opening whose periphery is formed by a first pair of spaced longitudinally aligned sockets, by a second pair of longitudinally aligned sockets transversely spaced from the first named pair of sockets and spaced apart a greater distance than the first named sockets, and by a pair of arcuate surfaces one concentrically disposed with respect to each of said first named sockets, and three pin units mounted in the seat frame and projecting into the opening and engageable successively with certain of said sockets and arcuate surfaces as the seat frame is revolved on the base structure, at least one of said pin units being constrained to move in paths conforming to the arcuate surfaces when the seat frame is rotated.

8. A seat adapted to be revolved from one terminal position to another terminal position including a relatively fixed base structure provided with a substantially horizontal plate, a seat supporting frame rotatably and shiftably mounted upon said base structure, three vertically disposed pins equally spaced from each other and fixedly mounted in the seat supporting frame, at least one of said pins being eccentric of the seat supporting frame, means on the base structure for holding said named eccentric pin fixed against translation with respect to the base structure, and guide means on the horizontal plate adapted to engage certain of said pins and constrain two of the pins to rotate about said named eccentric pin as a fixed pivot during rotation of the seat supporting frame through an angle of 90 degrees from one terminal position.

9. A seat adapted to be revolved from one terminal position to another terminal position including a relatively fixed base structure provided with a substantially horizontal plate, a seat supporting frame rotatably and shiftably mounted upon said base structure, three vertically disposed pins equally spaced from each other in triangular arrangement and fixedly mounted in the seat supporting frame, at least one of said pins being eccentric of the seat supporting frame, anti-friction elements mounted upon said pins, means on the base structure for holding said named eccen-

tric pin fixed against translation with respect to the base structure, and guide means on the horizontal plate adapted to engage certain of said pins and constrain two of the pins to rotate about said named eccentric pin as a fixed pivot during rotation of the seat supporting frame through an angle of 90 degrees from one terminal position.

10. A seat adapted to be revolved from one terminal position to another terminal position including a stationary base structure, a rotatable and shiftable seat supporting frame carried by the base structure, and means for causing the seat frame to shift laterally when rotated, said means including three vertically projecting pins fixed to the frame and located at the apexes of an imaginary equilateral triangle and guide means fixed relative to the base structure having portions engaging certain of the pins and adapted to constrain two of the pins to rotate about the third pin and having a portion holding said third pin fixed against translation with respect to the base structure while leaving said pin free to turn as a pivot when the seat supporting frame is rotated through an angle of substantially 90 degrees from a terminal position.

11. A seat adapted to be revolved from one terminal position to another including a stationary base structure, a rotatable and shiftable seat supporting frame carried by the base structure, and means for causing the seat frame to shift laterally when rotated, said means including three pin units having vertical axes disposed at the apexes of an equilateral triangle and fixed to the frame, at least one of said pin units being eccentric to the seat supporting frame and each pin unit including a roller element, arcuate guide means fixed relative to the base structure adapted to engage said roller elements and to constrain two of said pin units to rotate about said eccentric pin unit when the seat supporting frame is rotated through an angle of 90 degrees from one terminal position, and means holding said eccentric pin fixed against translation with respect to the base structure while leaving said pin free to turn as a pivot during said rotation.

12. A revolvable seat including a fixed base structure, a seat supporting frame rotatably and shiftable mounted upon said base structure, three vertically disposed pins equally spaced from each other in triangular arrangement and fixedly mounted in the seat supporting frame and projecting downwardly therefrom, fixed guide means associated with the base structure, engaging two of the pins and adapted to constrain said two pins to rotate about the third pin as a fixed pivot and having a portion holding said third pin fixed as a pivot when the seat frame is rotated, said guide means including an uninterrupted effective arcuate surface of substantially 90°.

13. A revolvable seat including a relatively fixed base structure, a seat supporting frame rotatably and slidably mounted upon said base structure, three vertically disposed pins each equally spaced from the others and fixedly mounted in the seat supporting frame and projecting downwardly therefrom, at least one of said pins being eccentric of the seat supporting frame, fixed guide means on the base structure adapted to constrain two of said pins to rotate about said named eccentric pin as a pivot when the seat is rotated, said guide means including a continuous arcuate surface concentric with the axis of rotation of said pivot pin adapted to guide one of said two pins continuously and independently of any other guiding means while the seat frame is

rotated through an arc of substantially 90 degrees, and means on the base structure for holding the named eccentric pin fixed against translation with relation to the base structure during said rotation.

14. In a revolvable seat, the combination of a base provided with a horizontal plate formed interiorly of its edges with an opening having a pair of spaced socket points, a seat frame mounted on the base, means for steadying the seat frame against tilting on the base comprising a pair of plates movable with the seat frame and slidably and rotatably engaging respectively the upper and lower surfaces of said horizontal plate and three triangularly spaced elements extending through said opening comprising posts securing said pair of plates together and engaging the edges of said opening, portions of the edges of said opening being curved respectively about said socket points as centers, said socket points and said curved edges and the spacing of said socket points and of two of said posts being such as to constrain rotation of two of said posts about a third post positioned at one of said socket points and to direct a second of said posts to the other socket point for further rotation.

15. In a revolvable seat, the combination of a base provided with a horizontal plate formed interiorly of its edges with an opening having a pair of spaced socket points, a seat frame mounted on the base, means for steadying the seat frame against tilting on the base comprising a pair of plates movable with the seat frame and embracing and slidably and rotatably engaging respectively the upper and lower surfaces of said horizontal plate and three triangularly spaced elements extending through said opening comprising posts securing said pair of plates together, laterally movable in said opening, and engaging the edges of said opening, portions of the edges of said opening being curved respectively about said socket points as centers, said socket points and said curved edges and the spacing of said socket points and of two of said posts being such as to constrain rotation of two of said posts about a third post positioned at one of said socket points and to direct a second of said posts to the other socket point for further rotation, said posts each being provided with means engaging the plates whereby the plates are maintained in spaced relation.

16. A revolvable seat including a pedestal member adapted to be fixed to a floor, a seat supporting member rotatably and slidably carried on the pedestal member, three pin units mounted on one of the members and projecting therefrom, a pair of spaced sockets provided on the other member, the first of said sockets receiving the first of said pin units and the second socket being spaced from the first socket a distance equal to the space between the first pin unit and a second pin unit, whereby the second socket is adapted to receive the second pin unit, and an arcuate surface formed on said other member concentrically disposed with reference to the first socket and engaging the third pin unit to guide said third pin unit concentrically about said first socket, when the seat supporting member is rotated, until said second pin is seated in said second socket.

17. A seat adapted to be revolved substantially 180 degrees between terminal positions including a pedestal member adapted to be fixed to a floor, a seat supporting member rotatably and slidably supported on the pedestal mem-

ber, three pin units mounted in one of said members and projecting therefrom, a socket in which one of said pin units is initially received, a second socket for thereafter receiving a second of said pin units, a pair of intercommunicating arcuate surfaces provided in said other member opposite the sockets in said member and each concentrically disposed with respect to one of said sockets, the third of said pin units being engaged with the first of said surfaces during part at least of the first half of said rotation and said sockets being spaced apart a distance equal to the spacing between the first and second pin units whereby said surfaces are adapted upon rotation of the seat supporting member to successively guide the third pin unit concentrically about the first socket during the first half of said revolution until the second pin unit seats in the second socket and to guide said third pin about said second socket during the second half of said revolution.

18. A revolvable seat including a pedestal member adapted to be fixed to a floor, a seat supporting member, means carried by one of said members having a pair of spaced apart sockets and a pair of cooperating intersecting arcuate guide surfaces each concentric with one of the sockets and extending outwardly approximately 90 degrees from their point of intersection, and a pair of pins carried by the other member and cooperating with said sockets and guide surfaces, one pin being seated in one socket and the other pin being engaged with an intermediate portion of the guide surface concentric with said socket in an initial position of the seat, said pins being spaced apart a distance equal to the spacing between said sockets, and means carried by the pin-carrying member and cooperating with one of the guide surfaces to maintain the first pin in the first socket and guide the second pin into the second socket and thereafter cooperating with the other guide surface to maintain the second pin in the second socket and guide the first pin out of the first socket and into engagement with the second guide surface.

19. A revolvable seat including a pedestal member adapted to be fixed to a floor, a seat-supporting member, means carried by one of said members having a pair of spaced apart sockets and a plurality of cooperating intercommunicating arcuate guide surfaces each concentric with one of the sockets, a pair of pins carried by the other member and cooperating with said sockets and guide surfaces whereby the seat-supporting member may be turned on the pedestal member from an initial position in which one pin is seated in one socket and the other pin is engaged with the guide surface concentric with said socket to a final position in which the other pin is seated in the other socket and the first named pin is engaged with the guide surface concentric with said other socket, and a third pin carried by said other member movable successively along said arcuate guide surfaces between terminal stop positions, portions at least of the space between the sockets and the guide surfaces being unobstructed for passage of the two first named pins.

20. A revolvable seat including a pedestal member adapted to be fixed to a floor, a seat-supporting member, means carried by one of said members having a pair of spaced apart sockets and a pair of cooperating intersecting arcuate guide surfaces each concentric with one of the

sockets and extending approximately 90° from their point of intersection, a pair of pins carried by the other member and cooperating with said sockets and guide surfaces whereby the seat-supporting member may be turned on the pedestal member from an initial position in which one pin is seated in one socket and the other pin is engaged with an intermediate portion of the guide surface concentric with said socket to a final position in which the other pin is seated in the other socket and the first named pin is engaged with an intermediate portion of the guide surface concentric with said other socket, and a third pin carried by said other member movable along said arcuate guide surfaces between terminal stop positions, portions at least of the space between the sockets and the guide surfaces being unobstructed for passage of the two first named pins.

21. A revolvable seat including a pedestal member adapted to be fixed to a floor, a seat supporting member, a pair of spaced apart sockets provided in one of said members and a pair of intersecting arcuate guide surfaces associated therewith in the member, each such surface having the adjacent socket as its center, stop surfaces provided at the outer ends of the arcuate guide surfaces, three pins projecting from the other of said members and engaged with the socket carrying member with one pin engaged with one stop surface and a second pin received in one of the sockets and the third pin being spaced from the second a distance equal to the spacing between the two sockets, whereby the first pin moves along said guide surfaces to the other stop surface thereof while guiding the second pin out of the first socket and the third pin into the second socket, each of the sockets having an unobstructed opening for passage of the two last named pins.

22. In a revolvable seat having a fixed base and a seat portion of substantially rectangular shape, means mounting the seat portion for movement from an initial terminal position with one longitudinal edge positioned close to a fixed wall substantially through 180° to a final terminal position with its other longitudinal edge positioned close to said wall, said means comprising a first pivot pin and socket mounting the seat portion on the base at a point in that half of the seat portion which is initially remote from said wall and at one side of the transverse median line of the seat portion, means guiding the seat portion to move through approximately 90° about said pivot, a second pivot pin and socket adapted to become engaged after said 90° movement at a point in the half of the seat portion which contains the first named point and at the other side of the transverse median line of the seat portion, and means guiding the seat portion to move through a succeeding 90° about said second named point.

23. In a revolvable seat having a fixed base and a seat portion of substantially rectangular shape, means mounting the seat portion for movement from an initial terminal position with one longitudinal edge positioned close to a fixed wall substantially through 180° to a final terminal position with its other longitudinal edge positioned close to said wall, said means comprising a member provided with a pair of pivot pins and a member having a pair of spaced sockets and cooperating arcuate guide surfaces, one member being secured to each of said base and seat portion, one pin being seated in a socket when the

5 seat portion is in one terminal position and the other pin being seated in the other socket when the seat portion is in the other terminal position whereby two successively effective points of pivotal rotation are provided, both points being initially spaced away from said wall farther than the longitudinal median line of the seat portion and said points being positioned on opposite sides of the transverse median line of the seat portion, and means cooperating with said guide surfaces guiding the seat portion to rotate initially about the first point as a center and finally about the second point as a center.

15 24. In a revolvable seat having a fixed base and a seat portion mounted for movement thereon, means carried by the seat portion and the base constituting a first pivotal connection for said parts located in the outer forward quarter of the seat portion, means guiding the seat portion to rotate from one terminal position through approximately 90 degrees about said pivotal connection as a center, other means carried by the seat portion and the base constituting a second pivotal connection for said parts located in the outer rear quarter of the seat portion, and means guiding the seat portion to rotate a second 90 degrees about said pivotal connection as a center to another terminal position.

25 25. In a revolvable seat having a fixed base and a seat portion mounted for movement thereon, a member carried by the base having a pair of sockets and a member carried by the seat portion having a pair of pins each engageable with one of said sockets to constitute a pair of pivotal points about which the seat portion may rotate successively, said sockets being located, when the seat portion is in one terminal position, in the outer forward quarter and the outer rear quarter, respectively, of the seat portion, and means guiding the seat portion to rotate approximately 90 degrees from one terminal position about one pin in the first named socket and thereafter approximately 90 degrees about the other pin in the second named socket to another terminal position.

45 26. A revolvable seat, including a fixed base structure, a seat supporting frame rotatably and slidably carried upon said base structure, three downwardly projecting pin units mounted in the seat supporting frame, a pair of spaced sockets provided in said base structure, the first of said sockets being adapted to receive the first of said

pin units and the second socket being adapted to receive a second of said pin units, an arcuate surface formed in said base structure concentrically disposed with reference to said first socket and adapted, when the seat frame is rotated, to guide said third pin unit concentrically about said first socket during movement of said second pin toward seating position in said second socket.

27. A seat adapted to be revolved in successive stages about different pivot points from one terminal position to another terminal position including a stationary base structure, a rotatable and shiftable seat supporting frame carried by the base structure, and means for causing the seat frame to shift laterally when rotated, said means including three vertically projecting pins fixed to the frame and located at the apexes of an imaginary equilateral triangle and guide means fixed relative to the base structure having portions engaging certain of the pins and adapted to constrain two of the pins to rotate about the third pin and having a portion holding said third pin fixed against translation with respect to the base structure while leaving said pin free to turn as a pivot when the seat supporting frame is rotated through an initial stage from a terminal position.

28. A revolvable seat adapted to be revolved in successive stages about different pivot points from one terminal position to another terminal position including a relatively fixed base structure, a seat supporting frame rotatably and slidably mounted upon said base structure, three vertically disposed pins each equally spaced from the others and fixedly mounted in the seat supporting frame and projecting downwardly therefrom, at least one of said pins being eccentric of the seat supporting frame, fixed guide means on the base structure adapted to constrain two of said pins to rotate about said named eccentric pin as a pivot when the seat is rotated through an initial stage from one terminal position, said guide means including a continuous arcuate surface concentric with the axis of rotation of said pivot pin adapted to guide one of said two pins continuously while the seat frame is rotated through said stage of rotation, and means on the base structure for holding the named eccentric pin fixed against translation with relation to the base structure during rotation through said stage.

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