

May 2, 1944.

W. J. SENGPIEL

2,347,753

CHAIR

Filed Aug. 19, 1942

2 Sheets-Sheet 1

FIG. 1.

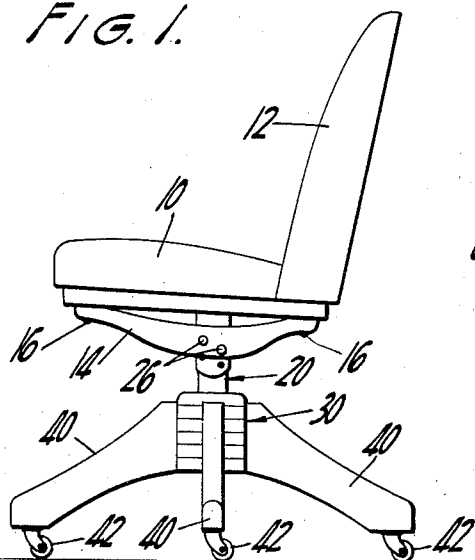


FIG. 5.

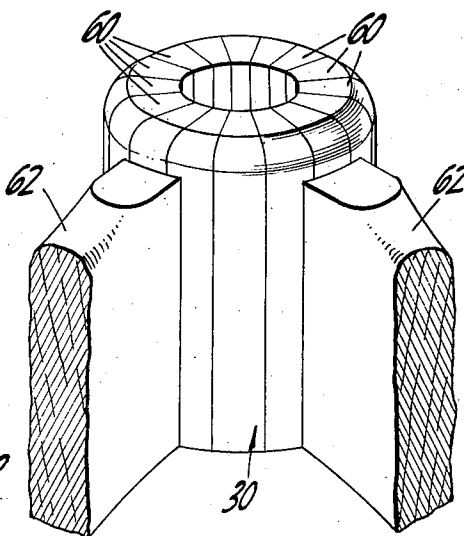


FIG. 4.

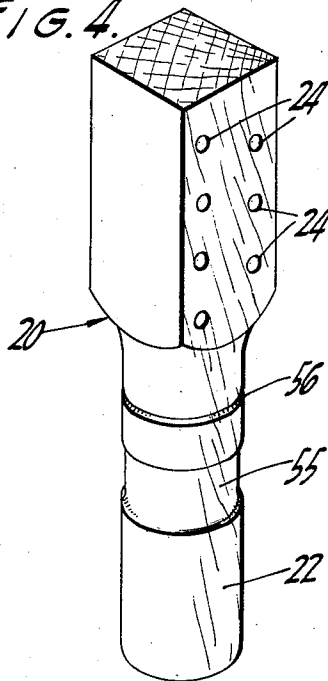
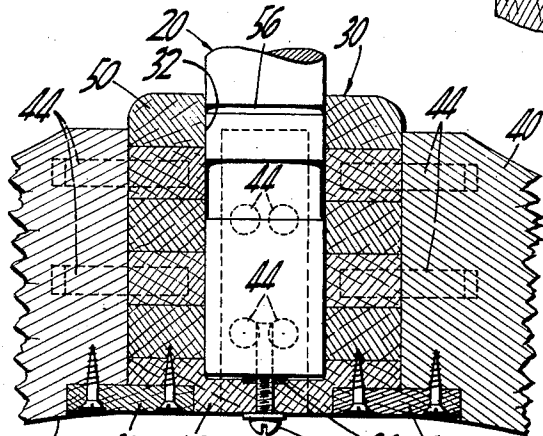
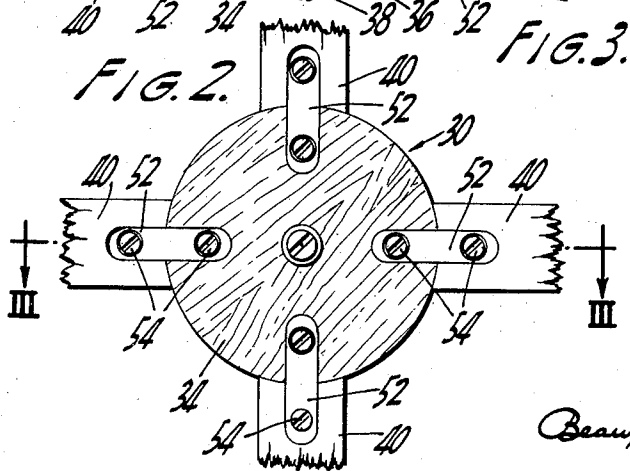


FIG. 2.



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FIG. 6.

FIG. 8.

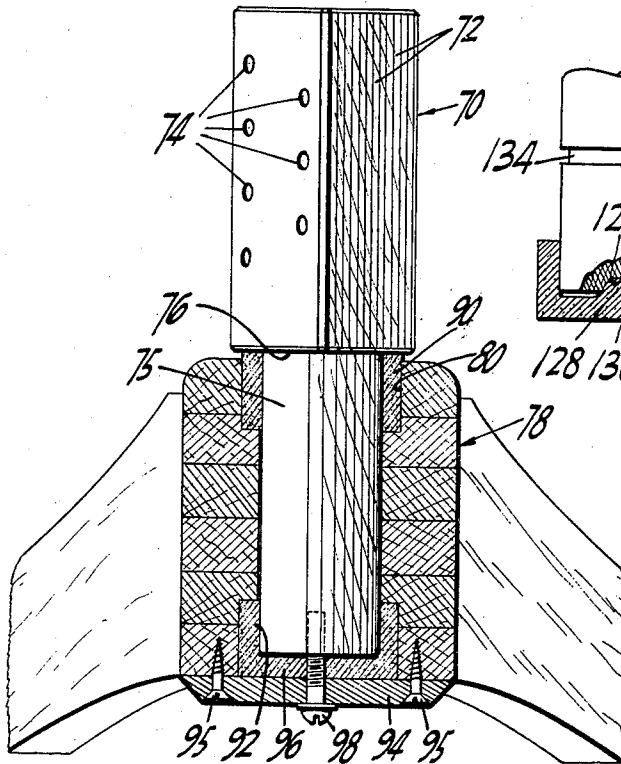
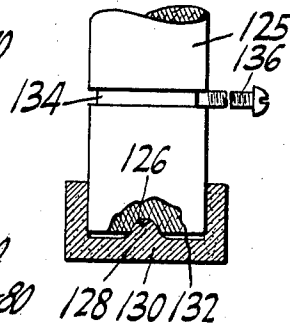
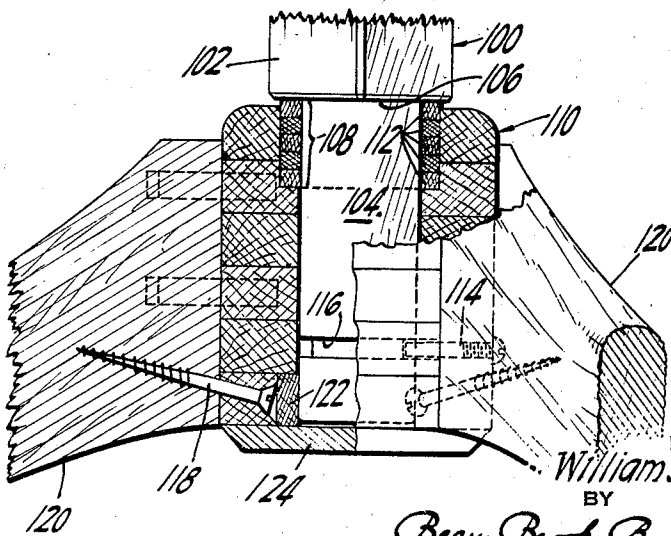


FIG. 7.



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Application August 19, 1942, Serial No. 455,301

6 Claims. (Cl. 155—95)

This invention relates to furniture, and more particularly to rotating seat type chairs or stools or the like.

One of the objects of the invention is to provide an improved rotating chair construction wherein substantially all of the parts thereof are formed of wood or other non-metallic material in an improved manner. Another object is to provide in a chair construction of the character described certain novel structural devices and arrangements whereby important functional features and advantages are obtained. A more specific object of the invention is to provide in a chair construction of the character described improved seat rotation bearing means and improved leg attachment arrangements. Other objects and advantages of the invention will appear in the specification hereinafter.

In the drawings:

Fig. 1 is an elevation of a chair of the invention;

Fig. 2 is a fragmentary bottom plan, on an enlarged scale, of the seat bearing structure of the chair of Fig. 1;

Fig. 3 is a fragmentary sectional view taken along line III—III of Fig. 2;

Fig. 4 is a disassembled view of the chair seat post element thereof;

Fig. 5 is a perspective view of another form of the seat bearing socket member;

Figs. 6 and 7 are views similar to Fig. 3 of other forms of the seat bearing arrangement; and

Fig. 8 is a fragmentary sectional view through another form of the seat bearing.

In the drawings, the invention is illustrated in conjunction with the provision of an office type chair having a seat portion 10 and a back rest portion 12 extending rigidly therefrom. However, it will be understood that the invention is applicable with equal facility to any other type of chair or stool construction, and that the seat back 12 of Fig. 1 may be hingedly mounted with respect to the seat 10 or otherwise attached thereto in any manner desired without affecting the application of the principles of the invention thereto.

The chair seat 10 is arranged to be supported by means of a pair of substantially parallel spiders or rails 14 which extend below the bottom of the chair seat and are attached thereto by means of connections 16—16. The rails 14—14 may be formed of wood or any other suitable material and shaped in plan view so as to converge inwardly from corner positions of connec-

tion to the chair seat toward the center thereof so as to register in lapped relation against opposite sides of the seat support post 20.

As illustrated in Fig. 4, the seat post 20 comprises generally a square-sectioned hard wood stock piece cut so that the wood grain runs longitudinally thereof. The post 20 is turned down at its lower end portion 22 so as to be of circular section for rotatably engaging within the socket portion of the seat bearing structure which will be referred to in detail hereinafter. The post 20 is transversely bored through its upper squared portion as indicated at 24 so as to be adapted to receive a pair of bolts or other suitable fasteners 26—26 (Fig. 1) when inserted through registering openings formed in the side rails 14—14, whereby the chair seat-back unit will be rigidly mounted upon the head of the post 20.

Preferably, the openings 24—24 through the post 20 are arranged in vertically spaced pairs comprising two laterally spaced holes each, and the bolts 26—26 are thus adapted to engage the rails 14 and the post 20 in laterally spaced relation to provide as rigid a connection as possible within the dimensional limits of the post head. Also, the holes 24—24 of each pair thereof are preferably arranged in vertically offset relation as shown in the drawing to strengthen the connection between the rails 14—14 and the connecting bolts 26—26. It will be apparent that inasmuch as the pairs of holes 24—24 through the post head are in vertically spaced relation, the post 20 is vertically adjustable relative to the chair seat 10 to suit different users of the chair; and that such adjustments may be effected at any time by simply withdrawing the bolts 26—26 and shifting the post 20 relative to the rails 14—14 to any desired position of adjustment and thereupon reinserting the bolts 26—26 to clamp the structure together. Preferably, the vertical precessional arrangement of the holes 24 is such that the distance between every other hole in the vertical scale thereof is bisected by the intermediate hole; and hence, for post adjustment purposes the post may be either simply raised or lowered relative to the seat for connection thereto through different pairs of holes 24, or the post may be raised or lowered and simultaneously rotated relative to the seat through 180° to provide an intermediate stage of adjustment. Consequently, as illustrated in Fig. 4, a group of three pairs of holes will provide three major adjustment arrangements and two intermediate adjustments, or a total of five possible adjustment arrangements.

As illustrated in Figs. 2 and 3, a hub or socket bearing member 30 is provided to receive the lower rounded end portion of the post 20 so as to be freely rotatable therein about the vertical or longitudinal axis of the post. To this end the hub 30 is constructed to comprise a generally cylindrical socket-like member having a circular bore 32 turned out to rotatably fit the lower turned end portion 22 of the post while supporting the latter against appreciable side play. The bore 32 terminates short of the lower end of the hub, thus leaving a bottom wall portion 34 which extends to substantially close the lower end of the bore 32 and to take the end thrust of the seat post 20. A metal washer 36 is preferably disposed between the post end and the bottom wall 34 of the hub to take the wear effects of the post rotating action; and a wood screw 38 is preferably provided to extend loosely through an aperture in the bottom wall 34 and through the washer 36 into screwthreaded connected relation with respect to the post 20. Hence, upon final assembly of the chair structure the entire unit may be readily lifted for transportation from place to place by simply grasping the chair at its seat or back portions without disengagement of the post from the hub.

The hub 30 is arranged to be supported relative to the floor or other supporting surfaces by means of a plurality of legs 40 arranged to connect at their upper ends to the hub structure and to radiate therefrom for bearing engagement against the floor at relatively widely spaced positions to provide suitable stability for the chair unit. Thus, as illustrated in Fig. 1, the legs 40 may be formed to curve gracefully outwardly and downwardly from the hub 30 and to terminate in foot portions carrying suitable casters 42 or other friction reducing devices as may be preferred; and it will be understood that for this purpose any number of legs may be employed in connection with the single hub 30.

The legs 40 are connected at their upper ends to the hub 30 by means of dowel pins 44 which are arranged to extend into the hub 30 and into the upper end portions of the legs 40 and to be cemented or otherwise suitably fastened therein. It will be appreciated that if the hub member 30 were formed of a single block of wood or the like, evaporation of the volatile constituents of the wood stock and absorption of moisture from the adjacent atmosphere would take place continuously at the outer surface of the hub structure and progressively inwardly thereof. This would result in establishment of stresses within the hub structure such as would tend to cause the member to split or become otherwise structurally weakened. In addition, the moisture variations that would normally take place within the body of such a wooden structure under changing temperature and humidity conditions would result in substantial dimensional instability in the form of expansion-contraction changes in the diameter of the bore 32 thereof.

For these reasons the use of a solid or single wood stock piece for the hub 30 would involve the disadvantage that the hub would be subjected after a relatively short period of service to the possibility of drying out to such an extent as to be liable to split or otherwise fail under the spreading loads imposed thereon by the chair post 20 in connection with normal use of the chair; and humidity variations in the surrounding atmosphere would cause the hub to alternately loosen and tighten upon the chair post in such

manner as to either provide side play therebetween or to bind the hub upon the post 20 so as to prevent free rotation of the seat. In addition, the loads imposed upon the leg connection devices 44 would tend to cause the connections to fail and would also tend to cause the hub 30 to split.

To avoid the above dangers and disadvantages, the hub of the invention is provided, as illustrated in the drawing, of laminar form whereby the structure comprises a series of superposed plates 50 of wood which are arranged so that the wood grain directions of adjacent plates are in substantially transverse directions. The plates 50 are cemented together by any suitable cementing medium such as glue or synthetic cement or resin substances such as are readily available on the market today. Thus, it will be appreciated that the expansion-contraction stresses of adjacent layers of the laminated structure will substantially balance out, and that the transverse dimensions of the bore 32 of the hub will remain substantially constant under all service conditions. Hence, development within the body of the hub of cumulative splitting stresses will be prevented. Also, it will be appreciated that by reason of this arrangement the dowels 44 of the leg connection devices may be so disposed as to enter the hub member 30 in such manner as to engage within wood grain structures thereof extending in transverse directions, and that therefore all of the leg connection dowels will penetrate cross grain wood structures as distinguished from end grain structures whereby the connections per se will be of improved order and whereby the engaged portions of the hub 30 will be braced in improved manner against splitting disruption loads transmitted thereto through the leg connections.

As illustrated in Figs. 2 and 3, supplementary connectors 52 may be provided in the form of links of plywood or metal or the like arranged to overlap adjacent abutting portions of the legs 40 and the hub 30 and to be connected thereto by means of screws or other suitable fasteners 54 so as to prevent the joints between the legs and the hub from spreading.

To provide the seat post 20 to be of improved resistance to humidity and temperature changes, the wood stock thereof is preferably impregnated by means of a composition comprising any suitable compound having an oil or resin or wax base having ingredients insuring penetration of the wood cells so that the post will be thoroughly water-proofed and sealed against entrance of moisture thereinto and against exit therefrom of the natural volatile constituents thereof. Preferably, the impregnating compound will be of non-oxidizing nature so that it will provide substantially permanent protection.

However, in view of the fact that extremely adverse weather conditions will sometimes operate to destroy the effectiveness of any water-proofing compound, it is preferred to arrange that the chair post 20 be permanently immersed in a bath of grease or wax or other suitable moisture-proof plastic substance which will simultaneously function as a friction reducing medium for the bearing between the post 20 and the hub 30. To this end the post 20 is peripherally grooved as illustrated at 55 so as to provide a substantial annular cavity between the post and the hub 30 which is adapted to contain a reserve of grease or wax or the like for the purpose referred to. Thus, the sealing medium so stored

within the bearing structure will be adapted to feed gradually to the contact bearing portions of the post and the hub members as required to maintain the latter in prime condition and to maintain the bearing unit in friction-free condition. Preferably, a supplemental groove 56 will be provided peripherally of the shaft 20 at a position just below the upper end of the hub 30 when the shaft is assembled relative to the hub. Thus, the groove 56 will also be adapted to contain a supply of grease or wax or the like at the immediate region of the greatest side thrust by the post 20 against the hub 30 under conditions of normal use of the chair, to feed this portion of the bearing connection with lubricant in improved manner. However, due to the limited size and grease carrying capacity of the groove 56 there will be no tendency toward slippage of grease therefrom upon the post 20 at positions above the hub 30, whereby utmost external cleanliness of the parts will be maintained at all times.

Fig. 5 illustrates a modified form of the hub arrangement wherein the hub structure is formed to comprise a series of laminar wood plates 60 arranged to extend longitudinally of the bearing axis and to radiate therefrom. It will be understood that the plates 60 will be interconnected by any suitable glue or cement or the like and that the grain structure of the wood stock thereof will be arranged to be disposed in transverse directions relative to the dowels of the legs 62 so as to obtain the features of improved strength and resistance to changing atmospheric conditions referred to hereinabove.

Fig. 6 illustrates another form of chair post and bearing hub of the invention wherein the seat supporting spindle 70 comprises a series of laminations of wood or other fibrous material joined together by an impregnating resin or other suitable cementing substance in the manner of modern plywood manufacturing practice. Thus, the spindle 70 comprises a series of laminations 72 to provide a stock piece of rectangular form; the upper end of which is bored as indicated at 74 to receive the chair seat connecting bolts referred to hereinabove. The lower end of the spindle 70 is turned down to cylindrical form as indicated at 75; thus providing a step or shoulder at 76 disposed normal to the axis of the spindle 70.

The bearing hub is indicated generally at 78 as being of laminar form as in the case of the hub of Figs. 1 to 3, but the hub 78 is counterbored at 80 in its upper face so as to be adapted to carry therewithin a bushing 90 for supporting the upper end of the turned spindle section 75. The bushing 90 is preferably formed of a suitable plastic or synthetic resin substance such as a phenol type resin known in the trade as "Bakelite" which has been impregnated with graphite. It has been found that this material provides a bearing for the purpose described having marked advantages from the standpoint of strength of support and friction-reducing characteristics when arranged to be employed with the wooden spindle referred to. The bushing 90 is arranged to seat firmly at its lower face upon the hub structure 78 and to extend at its upper end slightly above the level of the top elevation of the hub 78.

The lower end of the spindle 70 is arranged to be supported within the hub 78 by means of a bushing 92 formed of a suitable plastic substance as in the case of the bushing 90 and carried within a counterbored portion of the hub; and the bushing 92 is arranged to be supported

vertically within the hub by means of a cover plate 94 which spans the bushing and is connected to the hub as by means of screws 95. The bushing 92 is provided with a closing end wall portion 96 for taking the end thrust of the post 70 and for sealing the bearing against leakage of lubricant therefrom. A screw 98 may be inserted through a central apertured portion of the plate 94 and connected in screwthreaded relation to the lower end of the spindle so as to fix the spindle against vertically upward withdrawal from the hub subsequent to assembly of the device.

The lower end of the spindle section 75 may be terminated short of the position of the bushing end portion 96, whereby all of the downwardly directed loads upon the spindle will be taken by the upper end of the bushing 90, and in such case the lower bushing 92 will be called upon to take only laterally directed forces. Or, the end thrust of the post 70 may be taken by the bottom plate 94, as preferred. In any case the bottom plate 94 will seal the hub against leakage of lubricant therefrom. It has been determined that the use of "plastic" material for the bushings 90-92 obviates any tendency of the post to "stick" to the hub member, as in the case of a direct wood-to-wood contact; whereby the chair seat will be at times perfectly free to be swung about the axis of the post-bearing in response to the slightest kind of turning forces. Thus, the chair seat will at all times "feel free" to be rotated by the person seated thereon, and the seat will respond noiselessly and instantaneously to the application of rotational forces without giving off any "clicking" or dragging sounds such as tend to be produced by adhering bodies incident to commencement of relative movement therebetween.

Fig. 7 illustrates another form of bearing arrangement of the invention wherein the spindle member 100 is similar to the spindle 70 of Fig. 6 in that it comprises an upper section 102 and a cylindrical lower section 104 which is of reduced dimension whereby a transverse shoulder 106 is provided around the lower end of the spindle section 102 for bearing downwardly against the bushing device 108 of the hub 110. The hub 110 is of a form generally similar to the hub 78 of Fig. 6 and is counterbored at its upper portion to receive the bearing 108 therein as in the manner of the mounting of the bearing 90 of Fig. 6. However, the bushing 108 comprises a laminated structure composed of rings of fibre or of wood 112 cut from lumber in such manner as to have the wood grain running in transverse directions. As illustrated in Fig. 7, the upper ring 112 will be preferably formed of wood stock so cut that the wood grain runs vertically so as to present an "end grain" to the shoulder 106 of the spindle 100. The next lower ring 112 is preferably of lumber having the wood grain running in horizontal directions; and so on, alternately throughout the structure of the bearing 108.

The rings 112 of the bearing 108 are impregnated with "Bakelite" or other suitable plastic or synthetic resin substance so as to impart thereto the qualities of a solidified homogeneous and self-lubricating structure wherein the lamina thereof are cemented together by the plastic substance to provide an integral bearing structure. Thus, it will be understood that a structurally strong and frictionless bearing is provided and arranged for support of the spindle 100 within the hub 110 for the purpose of the invention.

It will be understood that the bearing 108 may be formed of any suitable wood or other fibrous substance which is adapted to be impregnated by a plastic or resinous material for the purposes explained hereinabove. As indicated at 114, a set screw or other key-like device may be mounted upon the hub 110 to extend at its inner end into a grooved portion 116 of the post 100 so as to fix the post against accidental withdrawal from the hub, and as illustrated at 118 wood screws may be driven diagonally through the hub structure to extend into engagement with the chair legs 120 to strengthen the structure against loads tending to "spread" the connections between the hub and the legs. A bushing 122 of "Bakelite" or other suitable plastic material is disposed in a counterbored lower end portion of the hub to take side thrust loads of the spindle 100, and a cover plate 124 is screwed or otherwise attached to the hub to provide a bottom step for the spindle and to seal the bearing against leakage of lubricant therefrom.

Figure 8 illustrates another form of bearing arrangement of the invention wherein the spindle 125 is similar to the spindle 104 of Fig. 7 except that the spindle 125 is recessed at 126 in the central lower end portion thereof to mate with a nub portion 128 of a cup bearing 130 which is generally similar to the bushing 92 of Fig. 6. Thus, it will be understood that the nub portion 128 will center the spindle 125 in the bearing 130 so as to appreciably relieve the side wall portions thereof of the side thrust forces of the spindle; and the parts are so proportioned and arranged that the nub 128 maintains the spindle in slightly elevated position relative to the bottom wall of the bearing 130 whereby the nub 128 will take all of the end thrust or vertical loads of the spindle and whereby a gap as indicated at 132 will exist to function as a reservoir for lubricant.

Thus, it will be understood that the bearing arrangement of Fig. 8 involves no perforation of the step bearing member, whereby the possibility of leakage of lubricant therefrom is positively avoided. As in the case of the bushings of Figs. 6 and 7, the bearing 130 of Fig. 8 will preferably be formed of a graphite impregnated plastic material, or any other suitable substance having the strength and lubricating properties referred to hereinabove. Also, as described in connection with Fig. 7 the spindle 125 of Fig. 8 will preferably be peripherally grooved as at 134 so as to be adapted to receive the end of a set screw 136 which is threaded through the adjacent chair hub structure, whereby upon final assembly of the spindle-bearing-set screw unit the spindle will be maintained in the hub structure against accidental displacement therefrom.

It will be appreciated that a particular feature and advantage of the present invention resides in the fact that the chair construction thereof employs substantially no metal parts and comprises only readily available materials which are economical to purchase and easy to work without use of specially skilled labor; and that although only a limited number of forms of the invention have been illustrated and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. A rotatable seat device comprising a base

including a hub, a spindle extending into said hub and rotatably bearing thereon and extending upwardly therefrom, and a seat fixed to the extending end portion of said spindle, said base comprising a leg structure and said hub mounted upon the upper end of said leg structure, said hub comprising a socket-like member of plywood, and said leg structure having dowel pins extending therefrom into different of the laminations of said hub and cemented therein, the individual plies of said hub being of sufficient thickness to more than receive a single of said dowel pins.

2. A rotatable seat device comprising a base including a hub, a spindle extending into said hub and rotatably bearing thereon and extending vertically upwardly therefrom, and a seat fixed to the extending end portion of said spindle, said base comprising a wood leg structure and a hub mounted upon the upper end of said leg structure, said hub comprising a socket-like member of plywood having lamina extending horizontally, and said leg structure having dowel pins extending therefrom into different of the laminations of said hub and cemented therein, the individual plies of said hub being of sufficient thickness to more than receive a single of said dowel pins.

3. A rotatable seat device comprising a base including a hub, a spindle extending into said hub and rotatably bearing thereon and extending upwardly therefrom, and a seat fixed to the extending end portion of said spindle, said base comprising a leg structure and a hub mounted upon the upper end of said leg structure, said hub comprising a socket-like member of plywood having lamina thereof extending axially and radially of said spindle and dowel pins extending from said leg structure into different of the laminations of said hub and cemented therein, the individual lamina of said hub being of sufficient thickness to more than receive a single of said dowel pins.

4. A rotatable seat device comprising a base including a wooden leg structure and a wooden hub mounted upon the upper end of said leg structure, a wooden spindle extending into said hub and rotatably bearing thereon and extending upwardly therefrom, a seat fixed to the extending end portion of said spindle, said hub comprising a socket-like member of plywood having the lamina thereof extending axially and radially of said spindle, wooden dowel pins extending from said leg structure into different of the laminations of said hub and cemented therein, said lamina being of sufficient thickness to more than receive a single of said dowel pins, said hub also including a cup-shaped bearing in the bottom portion thereof adapted to receive the lower end of said spindle in rotatable relation thereon and a collar bearing carried by said hub at the upper end thereof to encircle said spindle intermediately of its length, said bearings being formed of plastic substance.

5. A rotatable seat device comprising a base including a wooden leg structure and a wooden hub mounted upon the upper end of said leg structure, a wooden spindle extending into said hub and rotatably bearing thereon and extending upwardly therefrom, a seat fixed to the extending end portion of said spindle, said hub comprising a socket-like member of plywood having the lamina thereof extending axially and radially of said spindle, wooden dowel pins extending from said leg structure into different

of the laminations of said hub and cemented therein, said lamina being of sufficient thickness to more than receive a single of said dowel pins, said hub also including a cup-shaped bearing in the bottom portion thereof adapted to receive the lower end of said spindle in rotatable relation thereon, said bearing being formed of plastic substance and having a raised boss portion thereof disposed within a correspondingly recessed end portion of said spindle to guide the latter.

6. A rotatable seat device comprising a base including a hub, a wooden spindle extending into said hub and rotatably bearing thereon and extending upwardly therefrom, a seat fixed to the extending end portion of said spindle, said base comprising a wooden leg structure and a wooden hub mounted upon the upper end of said leg structure, said hub comprising a socket-

like member of plywood having the lamina thereof extending axially and radially of said spindle and wooden dowel pins extending from said leg structure into different of the laminations of said hub and cemented therein, said lamina being of sufficient thickness to more than receive a single of said dowel pins, said hub also including a cup-shaped bearing in the bottom portion thereof adapted to receive the lower end of said spindle in rotatable relation thereon, a collar bearing carried by said hub at the upper end thereof to encircle said spindle immediately of its length, said bearings being formed of plastic substance, and a set screw threaded through said hub to extend into a grooved peripheral portion of said spindle to maintain the latter against axial displacement from said hub.

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