Feb. 15, 1955 C. P. LILJENGREN 2,702,071

SEAT CONSTRUCTION

Original Filed Dec. 23, 1952 4 Sheets-Sheet 1

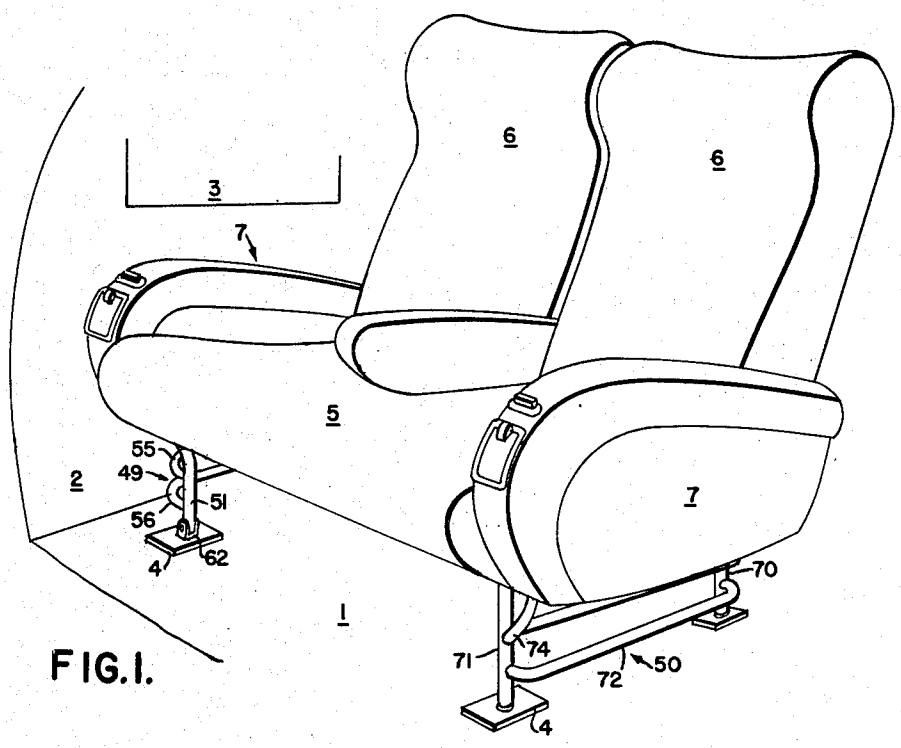


FIG. 1.

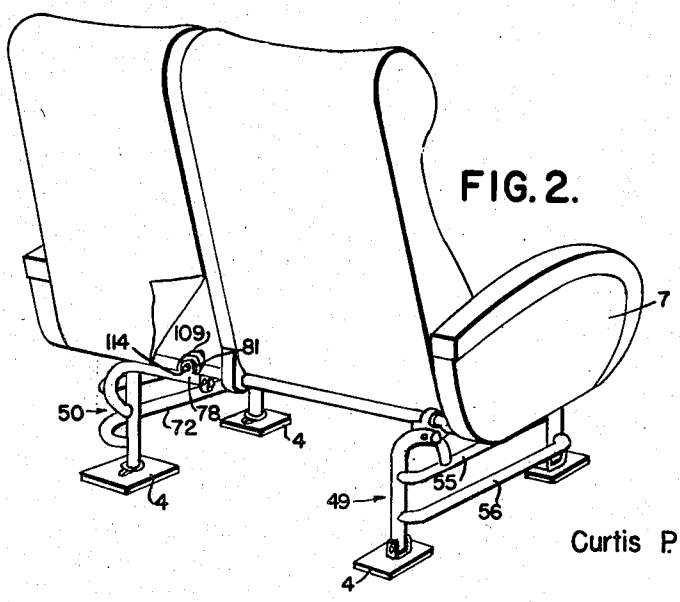


FIG. 2.

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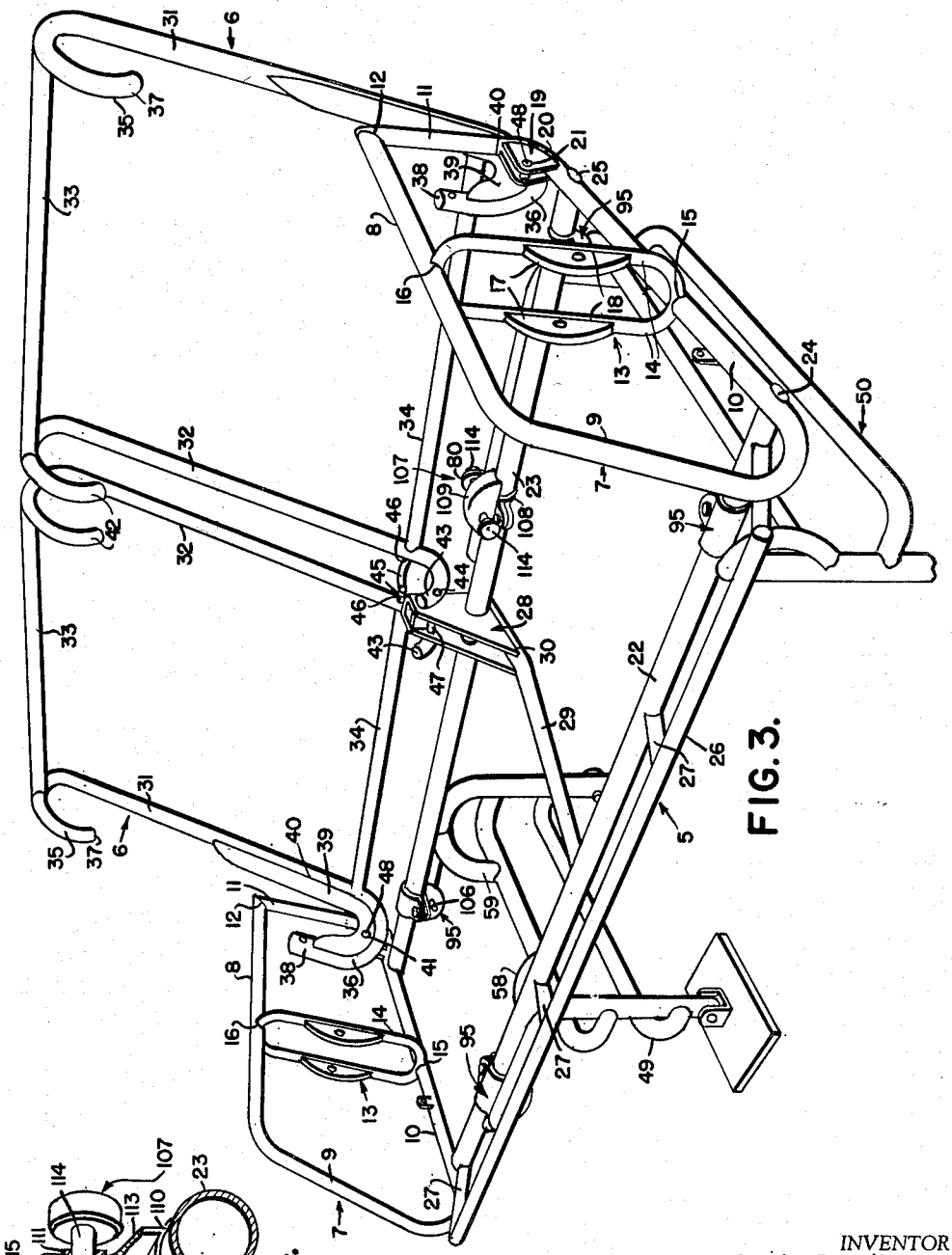


FIG. 3.

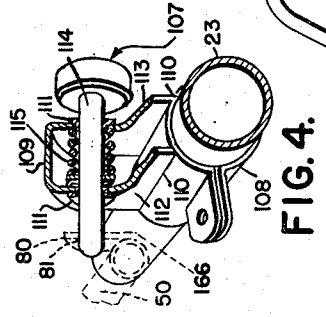


FIG. 4.

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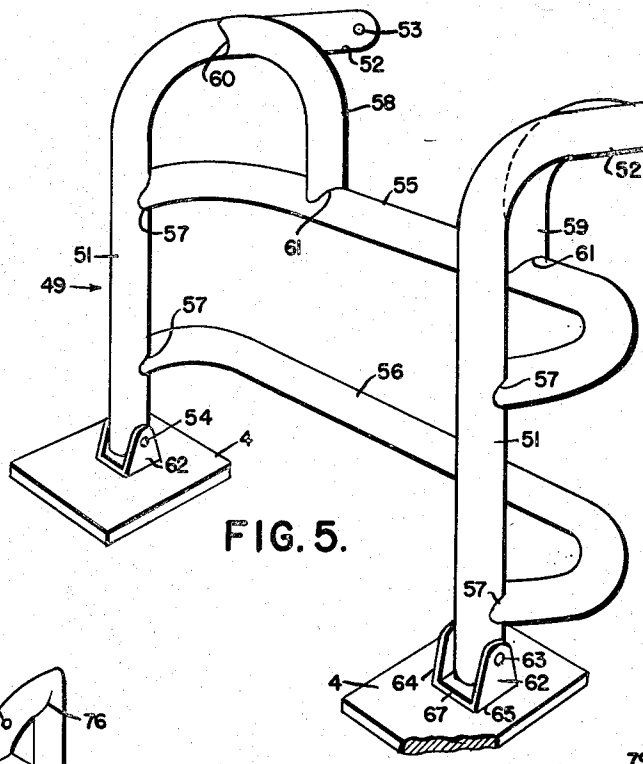


FIG. 5.

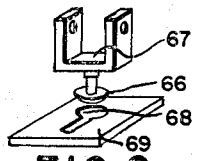


FIG. 6.

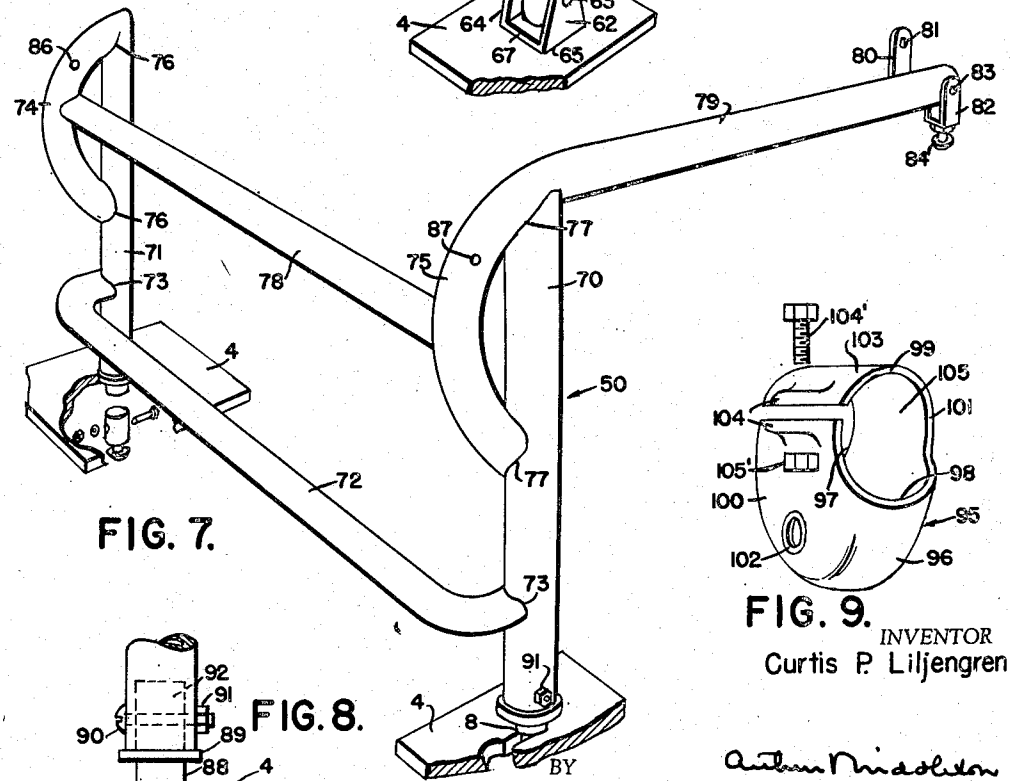


FIG. 7.

FIG. 8.

FIG. 9.

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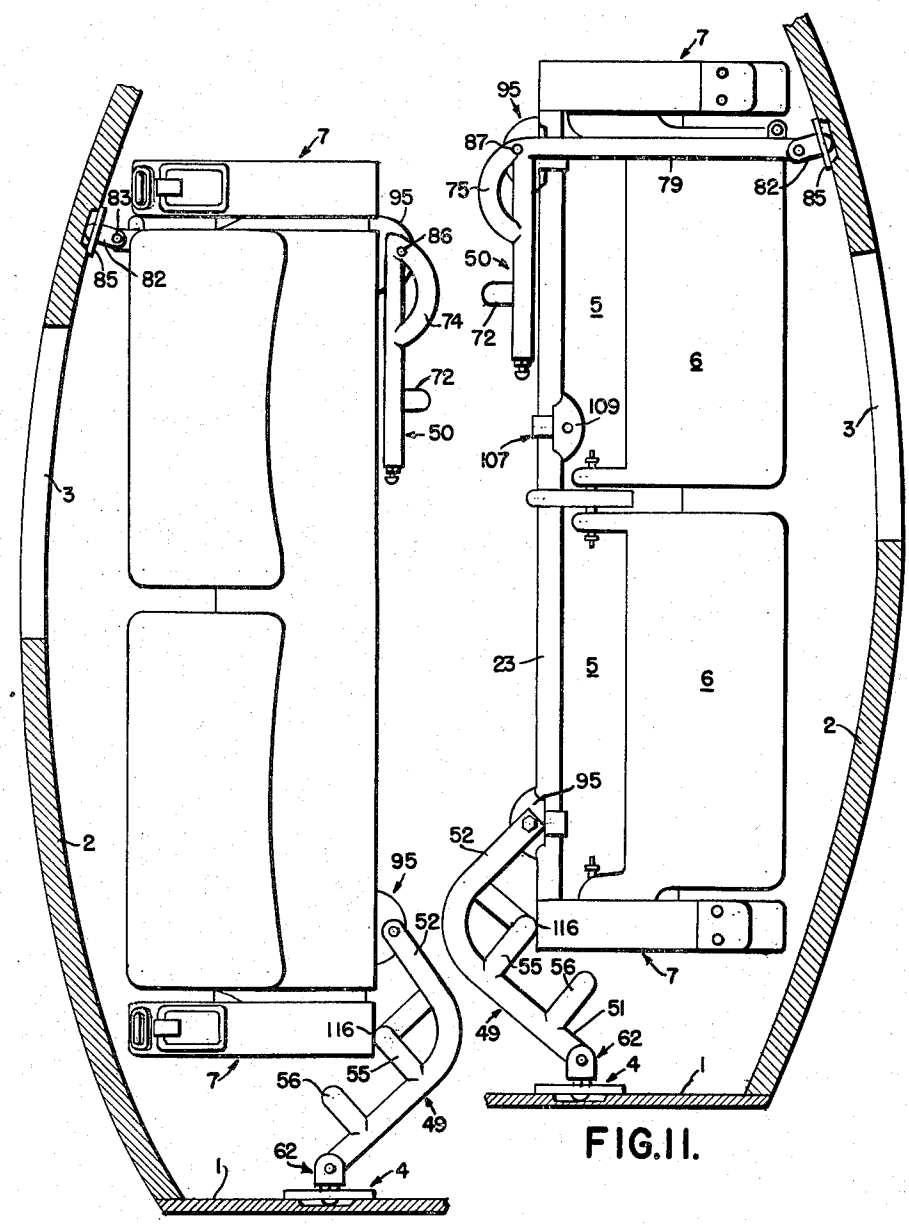


FIG. 10.

FIG. 11.

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2,702,071

SEAT CONSTRUCTION

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Original application December 23, 1952, Serial No. 327,570. Divided and this application September 17, 1953, Serial No. 380,655

12 Claims. (Cl. 155—5)

The present application relates to improvements in body-supporting chair or seat constructions as for airplanes, trains, automobiles, and other uses and is a division of my parent application Serial No. 327,570, filed December 23, 1952, for "Seat Construction." More particularly, this invention relates to improvements in construction providing for foldability.

A primary object of the present invention is to provide an improved cooperative relationship between the seat or chair back support and seat or chair bottom support and between the foregoing supports and the supporting legs so as to provide foldability of the seat and swingability from its passenger-carrying relationship to a substantially vertical wall-adjacent position wherein the seat assumes a compact folded relationship held in juxtaposition to the inner side wall of the airplane fuselage, the changeover being accomplished in a minimum number of steps and with facility. In connection with this object, it is still another object to provide improved support leg constructions that will be not only light in weight and able to withstand the expected loads but which will also be of such construction that when the chair is in its folded relationship, swung to its substantially vertical wall-adjacent position and held against the inside wall of the fuselage, protective bumper guards are exposed on the now inboard portion of the chair so that the crated shipments or other payload articles can be packed in the now widened aisle without damaging the chairs.

With the foregoing and other objects which will become apparent, the invention comprises generally a seat having a supporting framework for a seat base and back rest, each made up, under their pads and upholstery, of a plurality of spaced-apart, specially pre-curved, resiliently deformable strips as described in detail in my referred to copending application. The seat base framework is comprised of front and rear transverse tubular bars joined in spaced parallel relation by longitudinally extending bars, so as to form a tubular rectangle.

The leg constructions are different at each end of the chair but both are pivotally associated with the seat base framework by means of helmet-like pivot housings, with at least one spring-pressed lock selectively cooperatively associated with a leg construction to releasably hold the same securely and simply in supporting relationship. The leg constructions include vertical tubular floor-engaging legs with means joining the vertical floor-engaging legs, so arcuately shaped as to provide protective bumper guards to protect the chair when in its folded arrangement against the wall of the fuselage.

More specific details of the invention are described hereinafter.

In the drawings:

Fig. 1 is a perspective view of a double seat unit as seen from the front and as positioned in use in a fuselage;

Fig. 2 is a view similar to Fig. 1 but as viewed from the rear;

Fig. 3 is a perspective view of the framework of the seat unit as viewed from the front;

Fig. 4 is a detail perspective view with parts in section of a seat leg lock assembly;

Fig. 5 is an enlarged detail perspective view of the outboard seat leg construction;

Fig. 6 is a detail view of one of the U-type leg pivot fittings;

Fig. 7 is an enlarged perspective detail view of the inboard seat leg construction;

Fig. 8 is an elevational view, partially in section, of an attachment plate and headed stud connections;

Fig. 9 is a detail perspective view of a helmet-like attachment clamp unit utilized as a pivot housing for pivotally connecting the leg construction to the seat base framework;

Fig. 10 shows the seat unit framework in folded relationship and swung up against a side wall of the fuselage as viewed from the front; and

Fig. 11 is a view similar to Fig. 10 but as viewed from the rear.

Referring more particularly to the drawings, it will be seen that the seat unit, as shown a twin seat unit, is installed in an airplane cabin having a floor **1** and a side wall **2** which has a window **3**. The seat unit is attached to the floor by the attachment means **4**. The unit includes a seat base **5** and seat backs **6**, which are reclinable as by the means disclosed in the aforesaid application, and a side arm rest frame **7**.

The framing structure of the twin seat unit, as shown best in Figs. 2 and 3, is composed of light gauge, high strength steel tubing. Primary structural members may be made from ¾ inch diameter tubing with secondary structural members made from ⅝ inch diameter or smaller tubing. Of course, these dimensions can be varied in accordance with requirements.

The side arm-rest frame structure generally denoted **7** includes an endless element having a nearly horizontal upper support member or bar **8** which is diagonally downwardly and forwardly bent at its front end to form the front support member **9**, which member connects with the horizontal portion **10**, the upright portion **11** connecting the aft ends of bars or rods **8** and **10**. The rod or bar stock employed has its ends secured together at **12** by suitable means such as welding. A recline lock mechanism support structure **13** is attached near the mid-point of the side framing structure **7** and consists essentially of a small diameter tube **14** bent in the shape of an elongated loop with its major axis at or near vertical and with its minor axis perpendicular to the plane of the side arm-rest frame structure **7**. Attachment of the loop **14** to the side frame structure **7** is made at **15** while the open ends of the loop **14** are secured to the bar **8** at **16**. A pair of relatively thin metallic plates **17** are attached to the legs of the loop **14** by welding at **18**. Aligned holes parallel to the minor axis of the loop are drilled through the plates **17** to provide bearing housings.

The outboard back rest pivot support housing **19** formed from light gauge steel is welded at the intersection of tubes **10** and **11**, such attachment being denoted **20**. The support housing **19** has aligned openings therethrough which have a through-welded bushing **21** extending therethrough, the axis of bushing **21** being parallel with the axis of openings in the plates **17**. Since the side frame structures at either side of the chair are alike, a description of one suffices for both.

The side arm-rest frame structures **7** thus provided are held in longitudinal spaced relation by a front longitudinal tubular bar or beam **22** and a rear longitudinal tubular bar or beam **23** welded to the side frame **7** at **24** and **25**, respectively. A longitudinal tube **26** is held in parallel spaced relation to the member **22** by several struts **27**. The rear longitudinal beam **23** has a center arm-rest socket **28** attached thereto at its mid-point. Having continued reference to Fig. 3, a fore and aft spreader tube **29** is welded to socket **28** at **30** and welded to tube **22** at their intersection. The main seat base framing, thus completed, is in the form of a tubular rectangle.

Each seat back **6** includes an outboard side support member **31** and an inboard side support member **32**, both of which are shepherd's crook-like in form, connected by a top cross member bar or rod **33** and a bottom cross member bar or rod **34**. The members **31**, which may be of tubular stock, are formed at their upper ends **35** and their lower ends **36** into reversely curved portions, the upper curved portion **37** being adapted to have suitable head-rest means associated therewith such as the head-rest strips, as disclosed, in said copending application, the lower curved portion **38** serving as an

attachment for a suitable recline locking mechanism, also such as disclosed in said application. The lower curved portion 38 is slightly twisted so as to be out of the plane of the upper curve 37 in order to transfer the stub from without to the inside of the inboard face of the seat side trim panel. In order to provide additional strength for the seat backs, rigidifying gusset plates 39 are welded or otherwise secured to tube 31 around the curved portion 40. The gusset plates 39 are drilled for insertion of through-welded bushings 41 to serve as the pivot axis of the seat back. The axes of the bushings 41 are in alignment with each other and are perpendicular to the plane of the upper curve 35.

The tubular members 32 are formed at their upper ends into reversely curved portions 42 to match the curved portions 35 of members 31 and the lower ends 43 of tubular members 32 formed into reversely curved portions of lesser extent and of smaller radius than top curved portions 42. Members 43 have openings for insertion of through-welded bushings 44, the axes of which bushings coincide with the axes of bushings 41. Short struts 45, bent through an arc of approximately 90° are welded to tubes 32 at 46. The struts serve as a vertical recline limit stop as is described in detail in my copending application.

The seat back frames are pivotally connected to the main seat frame structure at the center by pivot bolt 47 and at the outboard sides by a pivot bolt 48 installed through pivot bushing 21, the latter mentioned bolt operating through pivot bushing 41 in the seat-back outboard side support shepherd's crook member 31.

Suitable covering for the arm rest structure may be employed, as desired. For a disclosure of a preferred arm rest covering, reference is again made to my copending parent application.

The means for supporting the seat base on the floor of the aircraft includes an outboard leg construction 49 and an inboard leg construction 50. Generally speaking, the outboard or wall-adjacent leg construction 49 is pivotally connected near its upper extremities to the seat base frame and pivotally connected at its lower extremities to the aircraft floor. The inboard or wall-distant leg construction 50 is pivotally connected near its upper extremities to the main seat frame and detachably connected at its lower extremity to the aircraft floor.

Details of the construction of the outboard leg construction 49 are best shown in Fig. 5. Identical vertical tubular floor-engaging legs 51 are bent approximately 90° at their upper ends to form bent knee portions or stubs 52. Openings are provided for insertion of through-welded pivot bushings 53 near the extremities of the stubs 52. Similar pivot bushings 54 are installed in the bottom of the vertical tubular legs 51. Horizontal tubes 55 and 56 are bent near their extremities to provide upper and lower curved struts which are welded to the vertical members 51 at 57. Arcuate members as short curved tubes 58 and 59 are welded to the top of each leg at the stubs 52 and the upper horizontal curved member 55 at 60 and 61, respectively, the curved tubes 58 and 59 thereby constituting rigidifying curved support between the upper strut and each leg extension or strut and also serving as bumper stops against 22 and 23, as shown in Fig. 3, to give side stability to the seat in one direction. U type pivot fittings 62 are hingeably connected to the vertical tubes 51 by bolts 63 extending through the parallel sides 64 and 65 of the fittings. The U type pivot fittings have headed studs 66 extending perpendicularly from the plane of the base 67 thereof, as shown best in Fig. 6, each for engagement in the keyhole shaped opening 68 of the plate 69 for retention thereby or may utilize one of a number of quick-detachable floor plates.

Referring to Fig. 7, the inboard leg construction 50 is comprised of two vertical tubular floor engaging legs, one of which is the rear vertical tube 70 and the other of which is the front vertical tube 71. A horizontal curved tubular bumper strut 72 similar to members 55 and 56 just described is welded to the vertical legs 70 and 71 at 73. An arcuate member or curved tube as 74, 75 extends from the top of each leg to a point on the leg above the strut 72, the ends of the arcuate member being welded to the respective leg as at 76, 77. A bar 78 connects medial portions of the arcuate members 74 and 75 and one of the latter members 75 has a lateral extension 79. The extension 79 has welded near its extremity vertical lug 80 bearing an indexing hole 81. A U type pivot bracket 82 similar to the above described pivot fittings 62 is pivotally connected to extension 79 by a pivot pin 83. The pivot bracket 82 contains a headed stud 84 similar to the above studs adapted to be detachably connected to a commercially-available quick-release wall plate such as indicated at 85 in Figs. 10 and 11. Arcuate members 74 and 75 are provided with openings to receive through-welded bushings 86 and 87, the axes of the bushings being aligned.

As shown best in Figs. 7 and 8, the lower extremities of the vertical tubular legs 70 and 71 have headed studs 88 received therein, the studs each having an enlarged annulus at 89 for bearing against the bottom of the respective leg. A bolt 90 and nut 91 extend through the leg extremity and shank portion 92 of each stud to releasably secure the same to its respective leg. The studs are adapted to be engaged through keyhole shaped openings 93 in the floor plates 94.

Referring to Figs. 3, 9, 10 and 11, the outboard leg 49 and the inboard leg 50 are shown to be pivotally connected to the tubular rectangle constituting the seat base. The means for pivotal mounting of the legs comprises a bar gripping clamp 95 having a hollow depending portion 96 presenting shoulders 97 and 98 which, with the arcuate wall at 99, cooperate with the supporting bar as 22 and 23. More particularly, the clamp pivot housing 95 is shown to be of helmet-like form having opposed flat wall portions 100 and 101 with aligned openings therethrough for the bushing 102 fixedly mounted therein. The helmet-like element has integral wall extensions terminating in the arcuate portion 103 and clamping portions 104. The helmet-like element may have the shoulders 97 and 98 outturned if widened contact with the bar received thereagainst is desired. Between the arcuate portion and shoulders 97 and 98 a passageway 105 is defined for the purpose of receiving the bar on which the helmet-like element is to be clamped, by means of bolt 104' and nut 105'. A bolt 106 is inserted through the bushing 102 of each helmet-like element and the bushings 53, 86, 87 of the legs to pivotally connect the legs to the bar to which the helmet-like element is connected.

Looking now at Figs. 3, 4, 6 and 7, the lock assembly 107 for separably securing the inboard seat support leg to the main seat frame structure is seen as being similar to the helmet-like element above described. The assembly is comprised of a C-type clamping portion 108 clampingly embracing the bar 23. A substantially semi-cylindrical shell 109 is welded to the clamp at 110 and has aligned bushings 111 in the flat walls 112 and 113. The plunger 114 extends through the bushings 111 and is spring loaded by the spring 115 so as to normally urge the plunger outwardly and into engagement with the opening 81 of the inboard leg 50.

In folding the seat unit from the relationship of Figs. 1, 2 and 3 to the relationship of Figs. 10 and 11, the procedure is as follows:

The inboard leg 50 is released from the quick detachable floor plates. Next, the lock assembly 107 is operated by pulling plunger 114 out of opening 81 to release the lateral extension 79 of the inboard leg. The twin seat unit, pivoting on the outboard leg pivot fittings 62, is pulled inboard toward the aisle until the outboard leg 49 rests upon the floor 1. The inboard end of the seat is then raised until the seat is in a vertical position. In this position, the member 55 of the outboard leg abuts the main seat frame at 116 to act as a stop. The inboard leg 50 is pivoted downwardly to lie flush with the seat bottom, thus causing the lateral extension 79 of the inboard leg to protrude horizontally beyond the upper seat back 6. The pivot fitting 82 on the lateral extension 79 of the inboard leg 50 is then made fast to the quick-detach wall plate 85 on the inside surface of the vertical wall of the airplane. In this position, the folded seat unit occupies a minimum of space, and the inboard leg bumper strut 72 and bar 78 serve to protect the upper portion of the seat from damage by cargo. The curve in the outboard leg 49 may be used as a tie-down anchor for securing cargo in the aircraft. The above mentioned arrangement has a further advantage in that folding of the seat is accomplished without the necessity for installation of lower cabin wall fittings, and the seat when in the stowed configuration occupies a position low to the

floor enabling the unit to be folded up under hat-racks and the like, usually installed on the upper cabin wall. Further advantage is obtained from the use of the bar gripping or pivot housing clamps **95** since they may be used to position the seat legs in various spaced relation longitudinally of the main seat frame for attachment of the seat legs to variously spaced floor plate patterns.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, since the scope of the invention is defined by the appended claims rather than by the description preceding them, and all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents, are therefore intended to be embraced by those claims.

I claim:

1. A body-supporting seat swingable upwardly against a wall, comprising a seat frame having at its wall-adjacent side a hinge connection by which the frame is swingable from body-supporting horizontal position to substantially vertical wall-adjacent position and vice versa, a reclinable back foldable down upon the seat frame, a leg construction hinged to the seat frame at the wall-distant side for pivotal movement to remain vertical as the seat frame is swung upwardly against the wall, wall-directed extension means supported from the leg construction, and means for releasably securing the extension means to the wall.

2. A body-supporting seat according to claim 1, wherein the leg construction has two legs and between the legs are struts curving away from the wall providing a bumper guard for the swung-up seat frame with its back in folded-down position.

3. A body-supporting seat according to claim 1, wherein the leg construction has two legs secured together, and the wall-directed extension means is an arm extending laterally from one of the legs.

4. A body-supporting seat according ot claim 1, wherein the leg construction has two legs secured together, the wall-directed extension means is an arm extending laterally from one of the legs, and means are provided for releasably securing the arm to the seat frame.

5. A body-supporting seat according to claim 1, wherein the leg construction has two legs secured together, the wall-directed extension means is an arm extending laterally from one of the legs, the seat frame is a tubular rectangle with a front bar and a rear bar, and means are provided for releasably securing the arm to the rear bar.

6. A body-supporting seat according ot claim 1, wherein the leg construction has two legs secured together, the wall-directed extension means is an arm extending laterally from one of the legs, the seat frame is a tubular rectangle with a front bar and a rear bar, and means are provided for releasably securing the arm to the rear bar comprising a bar-gripping clamp having a hollow depending portion presenting shoulders to the bar, a spring-pressed plunger supported from said portion, and an ear on the extension arm engageable by the plunger.

7. A body-supporting seat according to claim 1, wherein there is a second leg construction for supporting the wall-adjacent side of the seat frame having two legs each with a wall-directed extension, means for pivotally mounting the second leg construction from the seat frame, and struts between the legs of the second leg consruction curving toward the wall whereby at least one of the struts provides contacting pressure against the wall-adjacent side of the seat frame when swung upwardly against the wall.

8. A body-supporting seat according to claim 1, wherein the seat base is a tubular rectangle with a front bar and a rear bar, the leg construction also being tubular, and there are means for pivotally mounting the leg construction on said bars comprising a bar-gripping clamp for each leg having a hollow depending portion presenting shoulders to the bar, and means for pivoting each leg to the depending portion of one of the clamps.

9. A body-supporting seat according to claim 1, wherein the seat base is a tubular rectangle with a front bar and a rear bar, and wherein there is a second leg construction for supporting the wall-adjacent side of the seat frame having two legs with a wall-directed exension, means for pivotally mounting the extensions of the second leg construction on said bars.

10. A body-supporting seat according to claim 9, wherein the means for pivotally mounting the extension on the second leg construction on said bars comprises a bar-gripping clamp for each leg having a hollow depending portion presenting shoulders to the bar, and means for pivoting each leg to the depending portion of one of the clamps.

11. A leg construction for a seat frame swingable from body-supporting horizontal position to be vertically against a wall, comprising two vertical tubular floor-engaging legs, a curved bumper strut joining the legs, an arcuate member extending from the top of each leg to a point on the leg above the strut, a bar connecting these members, an extension on one of the members extending laterally of one leg, and wall-attaching means carried by the end of the extension.

12. A leg construction for a seat frame swingable from body-supporting horizontal position to be vertically against a wall, comprising two vertical tubular floor-engaging legs, an upper and a lower curved strut connecting the legs, the top of each leg curving into a lateral extension of each, and a rigidifying curved support between the upper strut and each leg extension.

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