Aug. 13, 1957 C. P. LILJENGREN 2,802,516

SEAT CONSTRUCTION

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

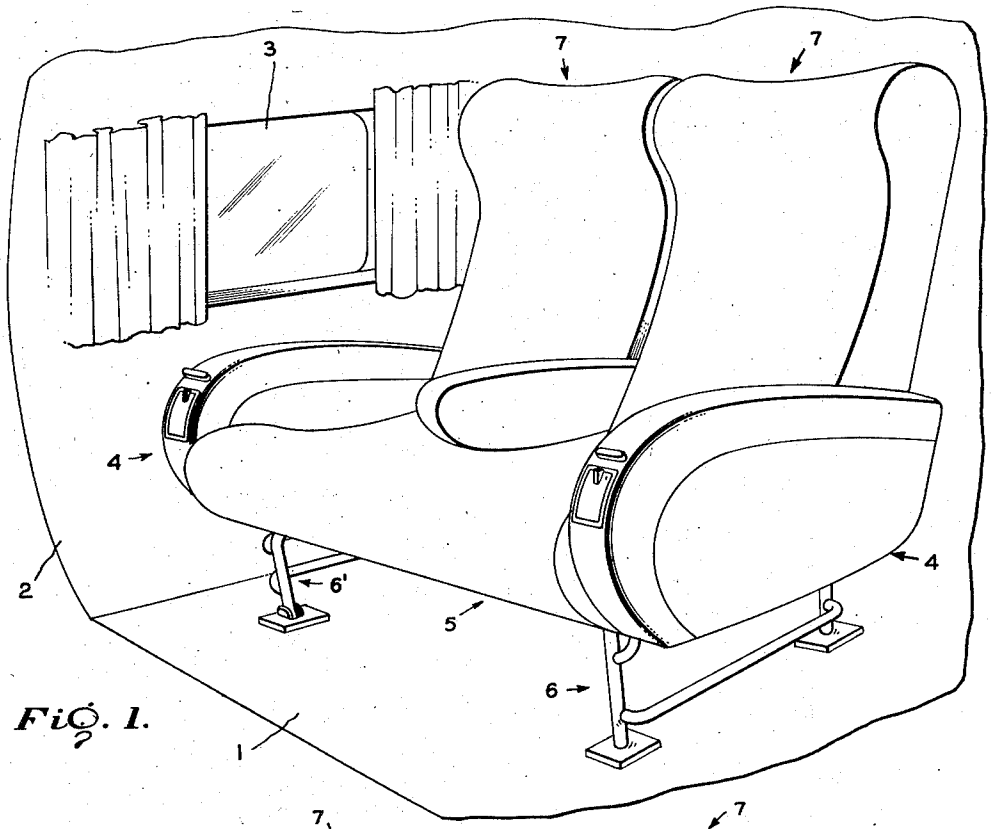



Fig. 1.

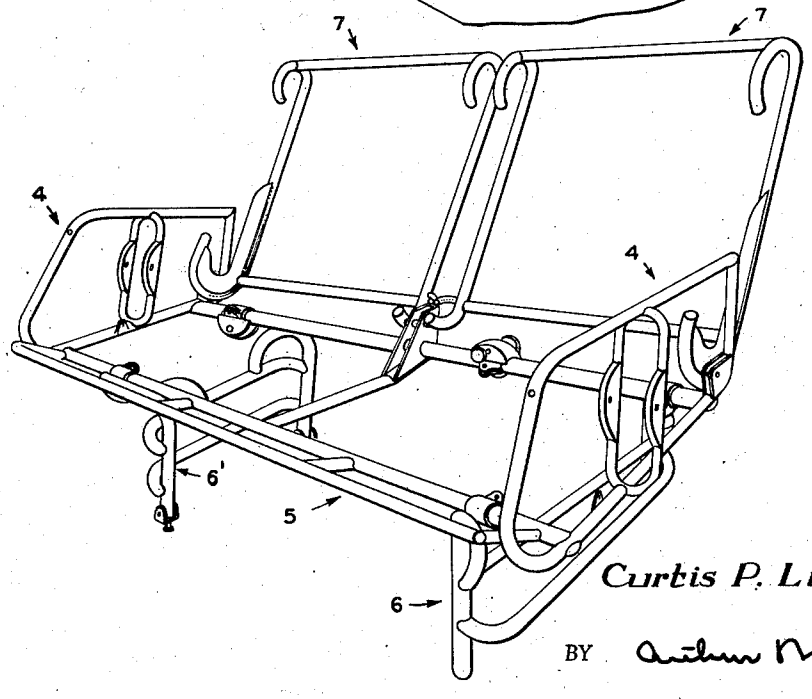



Fig. 2.

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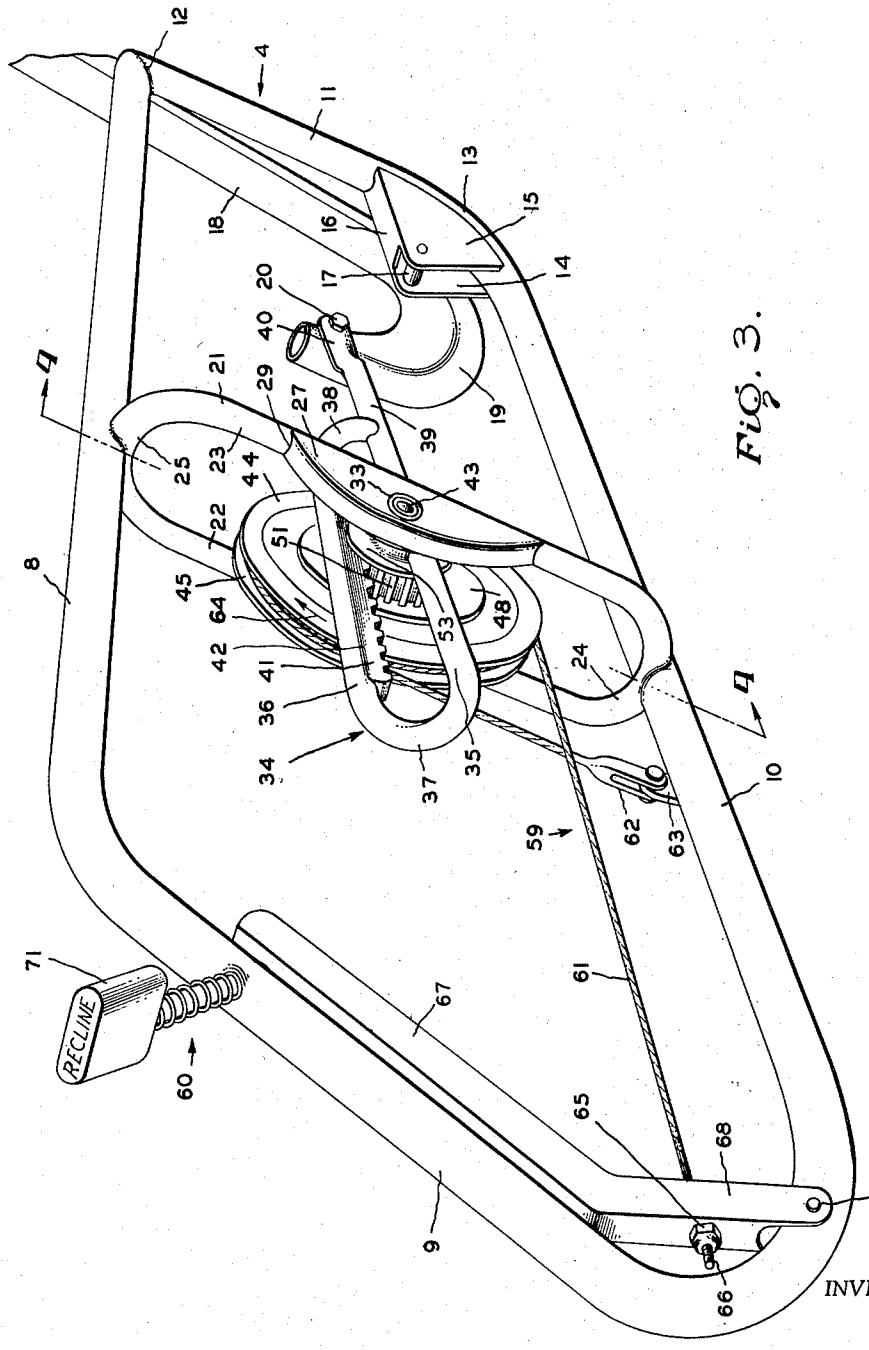



FIG. 3.

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SEAT CONSTRUCTION

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Fig. 4.

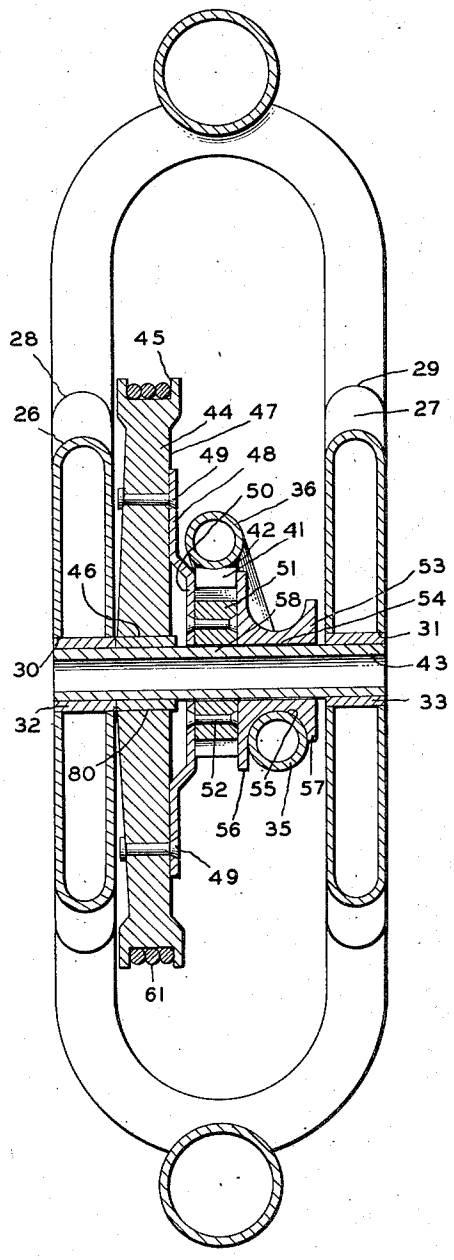



Fig. 5.

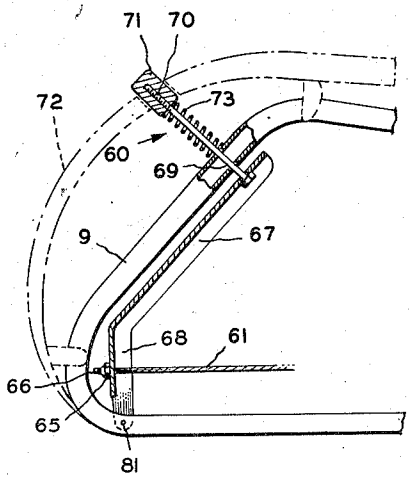
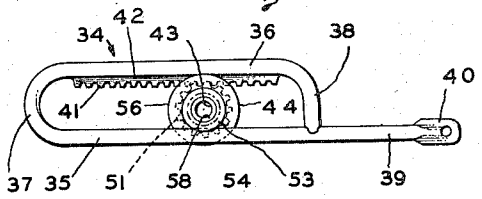



Fig. 6.



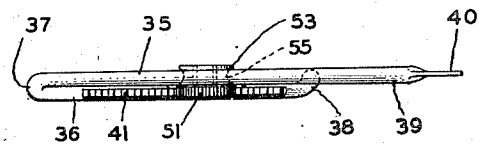




Fig. 7.

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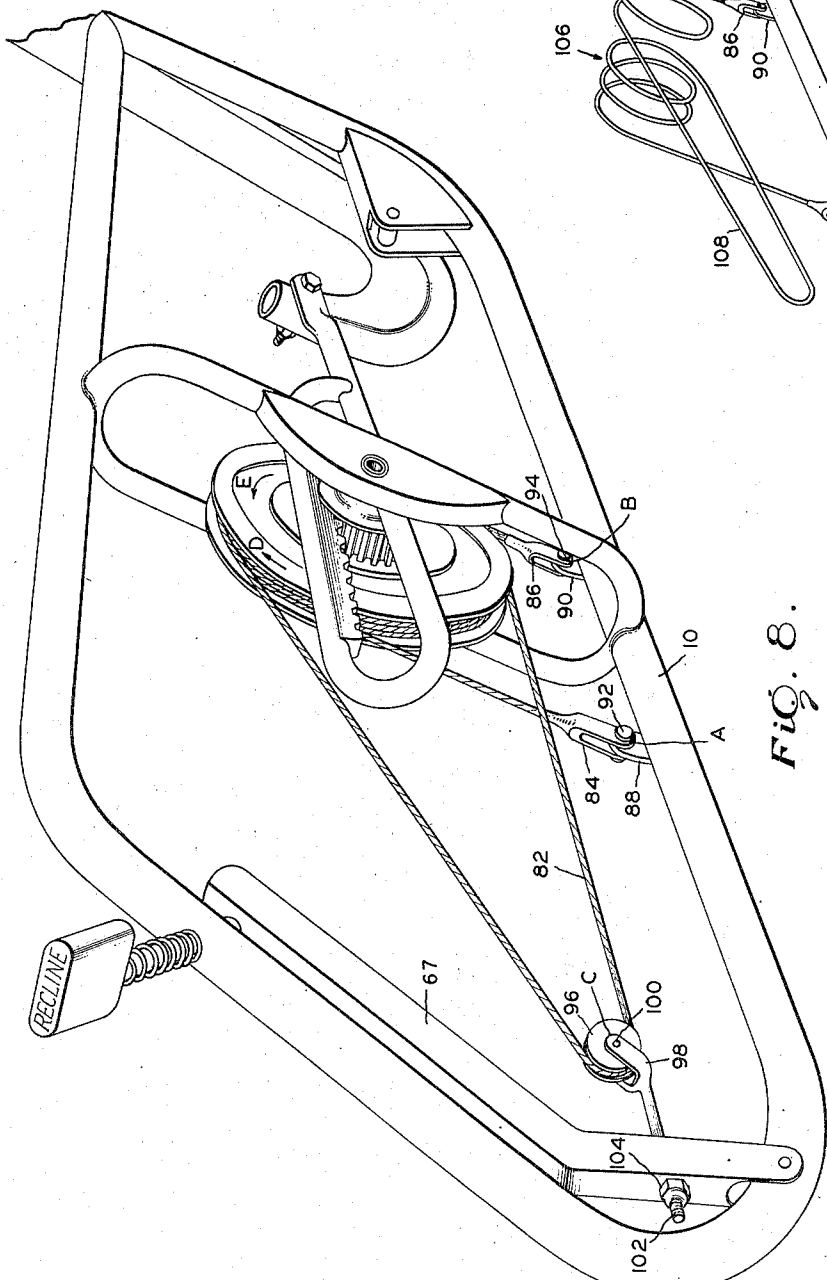



Fig. 8.




Fig. 9.

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United States Patent Office 2,802,516 Patented Aug. 13, 1957



2,802,516

# SEAT CONSTRUCTION

Curtis P. Liljengren, Miami, Fla., assignor, by direct and mesne assignments, to T & C Aircraft Corporation, a corporation of Delaware

Original application December 23, 1952, Serial No. 327,570. Divided and this application November 9, 1953, Serial No. 390,944

12 Claims. (Cl. 155—163)

The present invention relates to improvements in body-supporting seat constructions of the type having a reclinable back and a side arm rest and more particularly relates to an improved recline mechanism carried within the side arm rest and manually operable to permit pivoting movement of the reclinable back to the desired angle of recline and wherein return of the reclinable back to its upright position is accomplished merely by manual pushing of the reclinable back from the rear thereof. The present application is a division of my co-pending parent application, Serial No. 327,570, filed December 23, 1952, for "Seat Construction."

A primary object of the present invention is to provide an improved recline mechanism for body-supporting seats of the type having a reclinable back and at least one side arm rest wherein manually operable means is provided for permitting movement of the back to a reclined position, yet wherein return of the seat back to its upright position does not require the operation of the manual means so that when a plurality of such seats have their seat backs in various reclined positions, a person may return all of the seat backs to their upright relationship by successively exerting a force against the back of each of the seats.

A further object of the present invention is to provide an improved recline mechanism for body-supporting seats wherein several of the means thereof are commonly supported within the framework of the side arm rest and wherein a single reciprocable trombone-like member is provided for interconnection of the recline mechanism and seat back, which member inherently positively retains itself in operative engagement with the spur gear of the recline mechanism.

Still further, it is another object of the present invention to provide an improved arrangement within a recline mechanism which includes a trombone-like member one reach of which has a rack gear attached thereto for engagement with the spur gear of the recline mechanism, the other rackless reach being engageable with a spool coaxial with the spur gear for retaining the reach having the rack gear thereon in engagement with the spur gear.

A further object of the present invention is to provide an improved recline mechanism arrangement wherein the spur gear, spool and trombone-like member are so operatively associated as to positively maintain operative interconnection between the several elements and limit relative lateral movement to a negligible amount.

A still further object of the present invention is to provide an improved recline mechanism wherein the relatively movable elements thereof inherently maintain working clearances between themselves and prevent undesirable relative lateral movement and thus provide for running alignment between the trombone-like member and the spur gear.

Still another object of the present invention is to provide an improved arrangement for supporting the recline mechanism within the side arm rest of a body-supporting



seat whereby the recline mechanism is substantially protected from damage such as might occur from a blow to the side of the side arm rest and wherein the support is such as to maintain the several relatively movable elements in preselected juxtaposed relationship.

Various other objects and advantages will become apparent from the detailed description to follow. Generally speaking, my invention involves the provision of a loop-like support which is fixed to the substantially horizontal bars of the side arm rest, that is the upper and lower bars substantially medially of the length thereof, which loop-like support carries a pivot pin at about its medial portion. A spur gear, brake pulley and spool all are coaxially carried by the pivot pin with the spur gear and brake pulley fixed for movement with each other while the spool is separately rotatably mounted for rotation in a direction opposite to that of the spur gear and the brake pulley. The width of the loop-like support is such as to maintain the brake pulley, spur gear and spool in juxtaposed relationship. The spool is formed with a peripheral groove between side flange portions. A trombone-like member having spaced reaches is formed with a rack gear on one of its reaches while the rackless reach has an extension pivotally connected to the seat back. The rack gear is out of the plane of the pair of reaches and is in engagement with the spur gear while the rackless reach is engaged in the groove of the spool at the side of the pivot pin remote from the rack gear. One of the side flanges of the spool is of such diameter as to cooperate with the spur gear and rack gear so as to maintain the latter from relative lateral movement. The spacing between the rack gear and rackless reach is such as to maintain the working clearance between the rack gear and spur gear.

Manual release means is provided at the front of the side arm rest and a cable operatively associated with the manual release means extends therefrom and is wrapped around the brake pulley and terminates at a bracket connection with the bottom bar of the side arm rest. Normally, the manual release means applies a tension to the cable thus maintaining frictional contact between the cable and the brake pulley, thereby preventing backward tilting of the seat back. Manual release of the tension on the cable reduces the friction and permits backward tilting but in any event the seat back can be tilted forward regardless of operation of the manual release means.

When the straps as disclosed in my copending application #327,570 are installed on the seat frame, their tendency is to utilize the passenger's down weight on the seat bottom to automatically return the seat back from recline to vertical position. In order that seat back erection occur only when desired by the occupant, the cable drag in the pulley groove can be pre-set as desired so that it is necessary for the occupant to depress the recline knob to permit return of the seat back to upright position. Provision of this drag does not prevent erection of the seat back by hand, without depressing the recline knob, as mentioned above.

The invention is illustrated in the accompanying drawings in which:

Fig. 1 is a perspective view of a twin seat unit disposed in open operative position in the cabin of an airplane;

Fig. 2 is a perspective view of the seat unit framework;

Fig. 3 is an enlarged detail perspective view of one of the side arm rests showing the interior framework thereof and the recline mechanism housed therein;

Fig. 4 is a vertical transverse sectional view taken substantially along the plane of line 4—4 of Fig. 3;

Fig. 5 is a side elevational view of the portion of the

arrangement disclosed in Fig. 3 and showing details of the manual release means;

Fig. 6 is a side elevational detail view of the trombone-like member and showing its combinative relationship with the spur gear and spool;

Fig. 7 in a top plan view of the arrangement of Fig. 6;

Fig. 8 is a view similar to Fig. 3 but showing a modified form of mechanism; and

Fig. 9 is a somewhat diagrammatic showing of the cable arrangement as included in the modification.

Referring to the drawings in greater detail, and having reference to Fig. 1, it will be seen that a twin seat unit is disclosed as being mounted on the floor **1** of an airplane cabin having side wall **2** which has a window **3**. The seat unit is comprised of a framework as best shown in Fig. 2 which includes side arm rest frame structure generally denoted by the numeral **4**, seat bottom framework **5**, leg constructions **6** and **6'**, and tiltable or reclinable seat backs **7**. Suitable covering of the framework can be made in any desired fashion and as an example reference is made to my copending application wherein there is a disclosure of details of the covering and cushioning of the seat unit as well as details of the framework including the leg construction, seat bottom and seat back.

Having reference now to Figs. 3 and 4, it will be noted that the side arm rest frame structure **4** is comprised of an endless element having a substantially horizontal upper bar **8** which is diagonally downwardly and forwardly bent at its front end to form the incline bar portion **9**, which latter portion is reversely bent to provide the horizontal portion **10** which in turn is upwardly bent at its after end to form member **11**, which joins with the upper bar portion **8** at **12**. At the bend **13** between the portions **10** and **11** of the substantially rectangular bar framework of the side arm rest, a pair of substantially triangular plates **14** and **15** are secured, as by weld, a plate **16** joining the plates **14** and **15** along their upper edges to maintain the same in fixed parallel relationship. A pivot pin **17** is journaled through the plates **14** and **15** and pivotally supports the shepherd's crook-like seat back element **18** which terminates in curved element **19** in the manner specifically described in my referred to copending application. The upper end of the lower bend **19** in the seat back framework has a pin or bolt **20** secured thereto which provides an operative pivot connection for the recline mechanism presently to be described.

The support structure for the recline mechanism includes a loop-like support bar **21** which includes substantially parallel side portions **22** and **23** with the upper and lower and upper arcuate portions **24** and **25** respectively secured to the inside surfaces of the side arm rest bar portions **8** and **10** substantially at the medial portions of the latter. The loop-like member or elongated loop has its major axis substantially vertically disposed with its minor axis substantially perpendicular to the plane of the side arm rest frames **8**, **9**, **10** and **11**. Thin-walled, hollow plate-like elements **26** and **27** are disposed in substantially parallel relationship and are secured to the parallel legs **21** and **22** on common sides thereof as by weld at **28** and **29**. Aligned holes parallel to the minor axis of the loop are drilled through the plates **26** and **27** at **30** and **31** to provide bearing housings in which are received through welded bushings **32** and **33**.

The recline mechanism includes a trombone-like member **34** which has a substantially endless portion including a lower straight tube portion or reach **35**, an upper straight tube portion or reach **36**, arcuate portions **37** and **38** joining the reaches **35** and **36** and the reach **35** having an extension portion **39** terminating in a flat portion **40** through which the bolt **20** extends for pivotal connection of the trombone-like member **34** to the shepherd's crook-like member **18**. The reaches **35** and **36** are substantially parallel throughout their length but the upper reach **36** is laterally offset from the vertical plane of the other reach **35** and has a rack gear **41** secured to its under side as by weld **42**, the rack gear **41** being substantially parallel to the rackless reach **35** but out of the plane of pair of reaches **35** and **36**. The rack gear **41** is so related to the trombone-like member **34** that the transverse plane of the working face thereof is parallel to the axis of the hollow pivot pin or bolt **43** which is received within the bushings **32** and **33**.

Having continued reference to Figs. 3 and 4, it will be seen that there is provided a brake pulley **44** the outer periphery of which is grooved at **45** and the center of which is apertured at **46** so as to be journaled on the bushing **80** adjacent the plate **26**. Secured to the inside face **47** of the brake pulley **44** is a bracket plate **48**, rivets **49** or the like being employed for securement purposes. The plate **48** has an offset portion **50** of substantially circular form to which is secured the spur gear **51**, the diameter of the spur gear being less than the diameter of the offset portion **50** of the plate **48**. Rivets or other securement means **52** are employed for securement of the spur gear **51** to the offset portion **50** of the plate **48**. Adjacent the spur gear **51** and coaxially mounted on the pin **43** is a spool **53** having a central bore **54** therethrough which is of larger diameter than the external diameter of the pin **43** so as to substantially minimize frictional resistance between the spool **53** and the pin **43** when the spool is rotated relative thereto. The spool **53** has its periphery formed with a substantially semi-circular groove **55**, the radius of curvature of which is slightly larger than the radius of curvature of the tubular reach **35**. The groove **55** has annular flanges **56** and **57** at each side thereof with the flange **56** being sufficiently large in diameter to provide a retaining surface substantially coplanar with the juxtaposed face of the spur gear **51**.

It is to be noted that the attachment or adaptor plate **48** and spur gear **51** have the bore at **58** therethrough larger than the external diameter of the pin **43** so as to offer no frictional resistance to rotation of the brake pulley and spur gear relative to the pin **43**.

As shown in the figures under discussion and also in Figs. 6 and 7, the trombone-like member **34** has its rack **41** engaged with the teeth of the spur gear **51** at one side of the pivot pin **43** while the rackless reach **35** is on the opposing side of the pivot pin **43** and is engaged in the groove **55** of the spool **53**. Spacing between the rackless reach and the rack gear **41** is such as to maintain the rack gear in engagement with the spur gear with a working clearance therebetween. The formation of the groove **55** as well as the flange **56** and adaptor plate offset portion **50** maintains the trombone-like member from lateral displacement relative to the spur gear **51** and thus maintain running alignment between the top cooperative elements. It will thus be seen that with the trombone-like member **34** connected to the shepherd's crook-like member **18**, pivoting of the seat back will effect reciprocation of the trombone-like member relative to the pivot pin **43**, the engagement of the rack gear **41** with the spur gear effecting rotation of the latter and contact between the rackless reach **35** and the spool **53** may effect some rotation of the latter.

In order to prevent free backward pivoting of the seat back, there is provided cable friction means **59** and manual release means **60**. The cable means **59** includes a cable **61** one end of which terminates in a fitting **62** which is pivotally connected to the bracket **63** which in turn is secured to the bar portion **10** of the side arm rest framework. The cable **61** extends around the brake pulley **44** for several turns in the direction of the arrow **64** on Fig. 3. The free end of the cable **61** is brought forward and is attached by means of a nut **65** threaded on the externally threaded terminal end portion **66** of the cable to the pivot channel member **67**. The pivot channel member **67** is as best shown in Fig. 5 of angulated form so as to substantially conform to the front

end of the side arm rest framework, the lower end portion 68 thereof providing means to which the cable end 66 is attached by the nut 65. The channel 67 is pivotally connected at its lower extremity to the frame bar portion 10 by a pin 81. The manual release means 60 includes a bolt 69 which extends through the channel member 67 and terminates in a threaded portion 70 on which is threaded a recline knob 71 which is normally exposed through the covering for the side arm rest as designated in dotted line at 72 in Fig. 5. A coil spring 73 normally urges the recline knob 71 outwardly and thus urges the channel member 67 to pivot toward the front bar portion 9 thus leverably tensioning the cable 61 on the brake pulley 44, as will be understood.

In operation, it will thus be seen that when it is desired to rearwardly incline the seat back 7, the person sitting in the seat merely depresses the recline knob 71 thus overcoming the pressure exerted by the spring 73 and relieving tension on the cable 61. In this fashion frictional engagement with the periphery of the brake pulley 44 will be substantially reduced and the weight of the person sitting in the seat can then be utilized to push backwardly against the seat to recline the same. In so doing, it will be noted that the trombone-like element 34 which is connected to the shepherd's crook-like element 18 will pivot relative thereto and will move rearwardly causing rotation of the spur gear and brake pulley attached thereto. There will be no opportunity for the trombone-like member to become disengaged from the spur gear because of the structural arrangement.

When the desired degree of rearward inclination has been achieved, the person need merely release the recline knob and tension would be reapplied to the cable 61 thus frictionally limiting the rotation of the brake pulley 44, thereby holding the seat back in the desired relationship. As is the practice at each station stop, all of the seats in the airplane must have their seat backs returned to their upright position before the next flight. Although the seat backs may be in various degrees of relative inclination, all that is necessary is for the operator to exert a pushing force against the rear of each of the seat backs and the same will move forwardly inasmuch as the brake pulley offers a minimum of resistance to relative movement between the brake pulley and the cable in this direction. In this connection, it is to be noted that the cable 61 is not firmly anchored at its end 66 but can move as a result of pivoting of the element 67. Thus it is not necessary to depress the recline knob when returning the seat back to its upright position. The fixed connection at 62, 63 does not, on the other hand, permit the backward pivoting of the seat back until the recline knob is depressed to relieve frictional pressure between the cable and the brake pulley 44. Another advantage to this arrangement that is obvious is that forward load imposed on the seat back by the occupant in the seat behind, as may be caused during a crash, will cause the seat back to move forwardly easily thereby eliminating or reducing injury to passengers.

Further advantages to the arrangement hereinbefore described are that with the spool formation as described, the larger flange 56 is of sufficiently large diameter to hold the gear rack and spur gear teeth in cross-wise or lateral alignment. Furthermore, the radius of curvature of the groove in the spool is such as to provide running alignment for the trombone-like member 34. Also, the minimum diameter of the spool is such as to maintain proper vertical working clearance between the teeth of the rack gear and the spur gear.

Still further, the width of the spool is such as to provide proper spacing of the vertical loop-like support element to prevent the loop-like element from being jammed inwardly in service and binding the locking mechanism. In other words, the spool provides proper operating clearance around the axis of the pivot pin 43.



Additionally, the provision of the oversized bore in the spool as well as in the spur gear and adaptor plate 48 permits the same to freely rotate relative to the pin 43 and thus reduce drag on the trombone-like element thereby minimizing wear in service.

Another advantage to the arrangement above described is the utilization of the wheel and axle principle, wherein the load is applied near the axle, as in gear teeth, with resistance to the load occurring at the rim of the wheel distant from the axle, thus resulting in considerable mechanical advantage; thus reducing wear on the pulley and on the cable to a minimum.

A modification is illustrated in Figs. 8 and 9. Similar reference numerals are applied to parts similar to those in the above described embodiment, a further description thereof being deemed unnecessary. It is to be particularly noted, however, that the cable and anchoring means therefor differ from the above embodiment. The cable 82 has both its ends terminating in bifurcated fittings 84 and 86, the fittings being pivotally secured to the brackets 88 and 90 by pins 92 and 94, the brackets being fixedly secured to the bar portion 10 at longitudinally spaced points. The intermediate length of cable is encircled about the brake pulley or drum 44 and in the peripheral channel thereof, one of the turns about the pulley 44 is drawn outwardly and is engaged over the roller 96, the roller being journaled within the bifurcated portion 98 on pin 100. The bifurcated portion 98 has a shank extending therefrom terminating in a threaded portion at 102 which extends through pivot channel member 67 for adjustable securement thereto by the nut 104.

Fig. 9 diagrammatically shows the fixed ends of the cable 82 at 84, 88 and 86, 90 with the several intermediate coils 106 which are engaged over the brake pulley, the one coil or loop 108 being drawn outwardly and engaged over the roller 96. The channel pivot along with the adjustability of the nut 104 on the threaded shank end 102 provide for adjustable tensioning of the cable loops over the brake pulley, which tensioning affords the desired resistance to rotation of the pulley in either direction. Of course, such resistance in turn resists reclining of the seat back but it also resists return of the seat back to its upright position. It will be understood that such an arrangement may be particularly advantageous where the automatic back return is undesirable, as is the case in aircraft having rearwardly facing seats wherein forward acceleration upon take-off might tend to erect the seat backs.

When it is desired to recline the seat back or to return the seat back to its upright position, the passenger depresses the recline button and either exerts his weight against the seat back to recline the same or utilizes his "down" weight on the seat bottom to return the seat back to its upright position.

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. In a body-supporting seat having a reclinable back and side arm rest, a recline mechanism comprising supporting means carried by the side arm rest, a spur gear rotatably supported by said means, a spool rotatable relative to said gear and also rotatably supported by said means, a brake pulley fixed to said spur gear, means engaged about said brake pulley and operatively associated with a manually operable means carried by said side arm rest and normally frictionally holding said

brake pulley from free rotation in a first rotational direction while permitting rotation in a second rotational direction, and rack gear means in operative engagement with said spur gear and spool and held in alignment with said gear by said spool, and a connection between said rack gear means and said seat back.

2. In a body-supporting seat having a reclinable back and side arm rest, a recline mechanism comprising a loop-like support fixed to the side arm rest, a pivot pin supported by said loop, a spur gear and brake pulley commonly rotatably supported by said pin, a spool rotatable relative to said gear and brake pulley and rotatably supported by said loop, manual release means carried by the side arm rest, means engaged about said brake pulley and operatively associated with said manual release means and normally frictionally holding said brake pulley from free rotation in a first rotational direction while permitting rotation in a second rotational direction, and rack gear means in operative association with said spur gear and spool and held in alignment with said gear by said spool, and a connection between said rack gear means and said seat back.

3. In a body-supporting seat having a reclinable back and side arm rest, a recline mechanism comprising a loop-like support fixed to the side arm rest, a pivot pin supported by said loop, a spur gear and brake pulley commonly rotatably supported by said pin, a spool rotatable relative to said gear and brake pulley and rotatably supported by said loop, manual release means carried by the side arm rest, means engaged about said brake pulley and operatively associated with said manual release means and normally frictionally holding said brake pulley from free rotation in a first rotational direction while permitting rotation in a second rotational direction, and rack gear means in operative association with said spur gear and spool and held in alignment with said gear by said spool, and a connection between said rack gear means and said seat back, said rack gear means including a trombone-like member having spaced reaches, a gear rack on one of said reaches being substantially parallel with the other reach and engaged with said spur gear while the other reach is engaged against the periphery of said spool.

4. In a body-supporting seat having a reclinable back and side arm rest, a recline mechanism comprising a loop-like support fixed to the side arm rest, a pivot pin supported by said loop, a spur gear and brake pulley commonly rotatably supported by said pin, a spool rotatable relative to said gear and brake pulley and rotatably supported by said loop, manual release means carried by the side arm rest, means engaged about said brake pulley and operatively associated with said manual release means and normally frictionally holding said brake pulley from free rotation in a first rotational direction while permitting rotation in a second rotational direction, and rack gear means in operative association with said spur gear and spool and held in alignment with said gear by said spool, and a connection between said rack gear means and said seat back, said spool being co-axial with said spur gear, and said rack gear means including a trombone-like member having spaced reaches, a gear rack on one of said reaches being substantially equally spaced throughout its length from the opposing reach and being substantially out of the plane of the pair of reaches, the diameter of said spool and the spacing between the gear rack and the opposing reach being such that with the latter reach on one side of the pivotal axis and engaged with the spool and the gear rack on the opposing side of the pivotal axis a working clearance is provided.

5. In a body-supporting seat having a reclinable back and side arm rest, a recline mechanism comprising a loop-like support fixed to the side arm rest, a pivot pin supported by said loop, a spur gear and brake pulley commonly rotatably supported by said pin, a spool rotatable relative to said gear and brake pulley and rotatably supported by said loop, manual release means carried by the side arm rest, means engaged about said brake pulley and operatively associated with said manual release means and normally frictionally holding said brake pulley from free rotation in a first rotational direction while permitting rotation in a second rotational direction, and rack gear means in operative association with said spur gear and spool and held in alignment with said gear by said spool, and a connection between said rack gear means and said seat back, said spool being co-axial with said spur gear and having its periphery grooved, and said rack gear means including a trombone-like member having spaced reaches, a gear rack on one of said reaches being substantially equally spaced throughout its length from the opposing reach and being substantially out of the plane of the pair of reaches, said opposing reach having its transverse cross-section, substantially complementary to the groove of the spool, the diameter of said spool and the spacing between the gear rack and the opposing reach being such that with the latter reach on one side of the pivotal axis and engaged in said groove the rack on the other reach will be on the opposite side of the pivotal axis and engaged with said spur gear with working clearance and will also be held in running alignment with said spur gear.

6. In a body-supporting seat having a reclinable back and side arm rest, a recline mechanism comprising a loop-like support fixed to the side arm rest, a pivot pin supported by said loop, a spur gear and brake pulley commonly rotatably supported by said pin, a spool co-axial with said spur gear and brake pulley, closely adjacent said spur gear and rotatable on said pivot pin relative to said gear and pulley, manual release means carried by the side arm rest, means operatively associated with said manual release means and normally frictionally holding said brake pulley from free rotation in a first rotational direction while permitting rotation in a second rotational direction, rack gear means, a connection between said rack gear means and said seat back, said rack gear means including a trombone-like member having spaced reaches, a rack gear on one of said reaches being substantially parallel with the other of said reaches and engaged with said spur gear, said spool having its periphery provided with a continuous groove between side flange portions, one of said side flange portions being substantially coplanar with the closely adjacent face of the spur gear so as to hold the rack gear and spur gear in cross-wise alignment, said other reach being substantially complementary to said groove and disposed on the side of the pivotal axis remote from said rack gear and so spaced therefrom as to be engaged within the groove of the spool while maintaining working clearance between the rack gear and the spur gear.

7. In a seat having a reclinable back and side-arm rest, a recline mechanism therein comprising a trombone member for operatively connecting the mechanism to the reclinable back having a substantially endless portion with first and second reaches joined together, one of the reaches having an extension portion beyond its connection with the other reach for pivotal connection to the reclinable back, the other reach having a rack affixed thereto out of the plane of the two reaches, the recline mechanism also including a spur gear, a spool rotatable relative to the spur gear and adjacent thereto, the rackless reach being in the plane of said spool and engaged therewith for guided reciprocating movement in an arcuate path while the rack on the other reach is operatively associated with said spur gear, and the rackless reach being disposed on the side of said spool opposite to the side on which the rack is disposed relative to the spur gear so as to retain the rack in engagement with the spur gear.

8. In a body-supporting seat having a reclinable back and side arm rest, a recline mechanism comprising a loop-like support fixed to the side arm rest, a pivot pin

supported by said loop, a spur gear and brake pulley commonly rotatably supported by said pin, a spool co-axial with said spur gear and brake pulley, closely adjacent said spur gear and rotatable on said pivot pin relative to said gear and pulley, manual release means carried by the side arm rest, means operatively associated with said manual release means and normally frictionally holding said brake pulley from free rotation in a first rotational direction while permitting rotation in a second rotational direction, rack gear means, said rack gear means including a trombone-like member having spaced reaches joined at their ends, and one of said reaches having a rack gear secured thereto, and the rackless reach having an extension pivotally connected with the seat back at a point offset from the pivot mounting for the seat back, said rack gear being out of the plane of said reaches and engaged with said spur gear, said spool having its periphery provided with a continuous groove, said rackless reach having a cross-section substantially complementary to said groove and disposed on the side of the pivotal axis remote from said rack gear and so spaced therefrom as to maintain a working clearance between the spur gear and gear rack.

9. In a body-supporting seat having a reclinable back and side arm rest, a recline mechanism comprising a loop-like support fixed to the side arm rest, said loop-like support being of predetermined inside width and supporting a pivot pin across its width, a spur gear, brake pulley and spool co-axial with and carried by said pin with said spool adjacent said spur gear, said spur gear and brake pulley being fixed relative to one another and rotatable relative to said spool and the sum of the widths of said spur gear, brake pulley and spool being such as to be substantially equal to the inside width of said loop-like support, manual release means carried by the side arm rest, means operatively associated with said manual release means and normally frictionally holding said brake pulley from free rotation in a first rotational direction while permitting rotation in a second rotational direction, rack gear means, a connection between said rack gear means and said seat back, said rack gear means including a trombone-like member having spaced reaches, a rack gear on one of said reaches being substantially parallel with the other of said reaches and engaged with said spur gear, said spool having its periphery provided with a continuous groove between side flange portions, one of said side flange portions being substantially coplanar with the closely adjacent face of the spur gear so as to hold the rack gear and spur gear in cross-wise alignment, said other reach being substantially complementary to said groove and disposed on the side of the pivotal axis remote from said rack gear and so spaced therefrom as to be engaged within the groove of the spool while maintaining working clearance between the rack gear and the spur gear.

10. In a body-supporting seat having a reclinable back and a side arm rest, a recline mechanism comprising supporting means carried by the side arm rest, a spur gear rotatably supported by said means, a spool rotatable relative to said gear and also rotatably supported by said means, a brake pulley fixed to said spur gear, manually operable means carried by said side arm rest, means engaged about said brake pulley and operatively associated with said manually operable means for normally frictionally holding said brake pulley from free rotation in at least one rotational direction, and rack gear means in operative engagement with said spur gear and spool and held in alignment with said gear by said spool, and a connection between said rack gear means and said seat back.

11. In a body-supporting seat having a reclinable back and a side arm rest, a recline mechanism comprising supporting means carried by the side arm rest, a spur gear rotatably supported by said means, a spool rotatable relative to said gear and also rotatably supported by said means, a brake pulley fixed to said spur gear, manually operable means carried by said side arm rest, means engaged about said brake pulley and operatively associated with said manually operable means for normally frictionally holding said brake pulley from free rotation in either rotational direction, and rack gear means in operative engagement with said spur gear and spool and held in alignment with said gear by said spool, and a connection between said rack gear means and said seat back.

12. In a body-supporting seat having a reclinable back and a side arm rest, a recline mechanism comprising supporting means carried by the side arm rest, a spur gear rotatably supported by said means, a spool rotatable relative to said gear and also rotatably supported by said means, a brake pulley fixed to said spur gear, means engaged about said brake pulley for normally frictionally holding said brake pulley from free rotation in either rotational direction, rack gear means in operative engagement with said spur gear and spool and held in alignment with said gear by said spool, and a connection between said rack gear means and the seat back, and manually releasable means operatively associated with the means engaged about the brake pulley for freeing said pulley for rotation in either direction.

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