

[54] **TRUNK SUPPORT FOR SITTING PATIENTS**

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[58] **Field of Search**297/389, 390, 384

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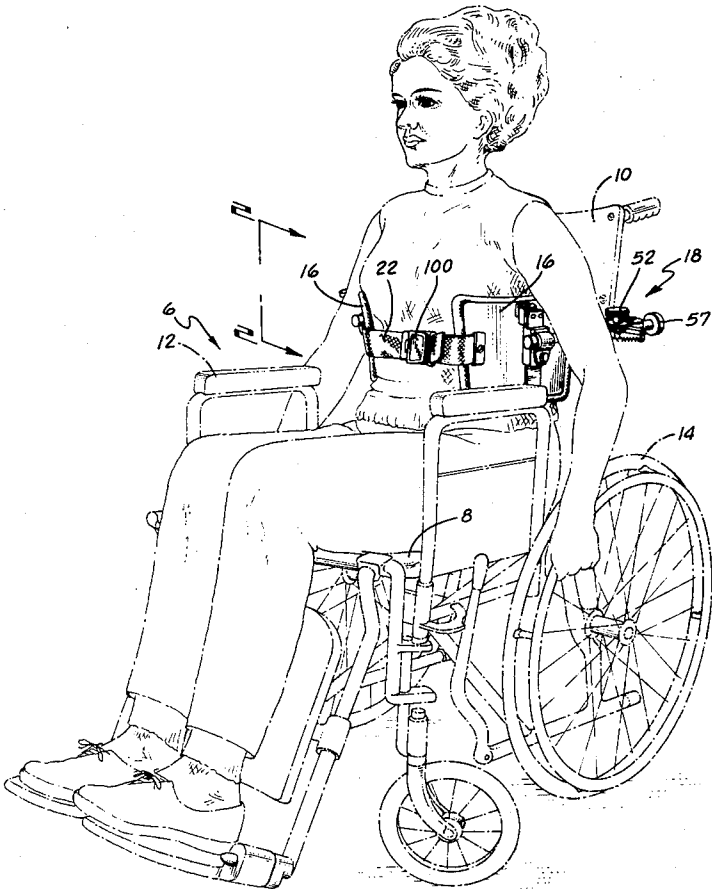
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[57] **ABSTRACT**

A trunk support for use with wheelchairs and the like having contoured trunk support plates disposed laterally of and in supporting contact with the patient's trunk. The plates are secured to the backrest of the chair, are universally movable for adjustment to the patient's size and shape, and are locked in the supporting position. The plates can be opened to permit the patient to enter or alight from the chair. Stop means are provided so that each time the plates are moved into their trunk supporting position they return to an identical, predetermined position to thereby eliminate the need for adjustments of the plate while used with the same patient.

13 Claims, 3 Drawing Figures



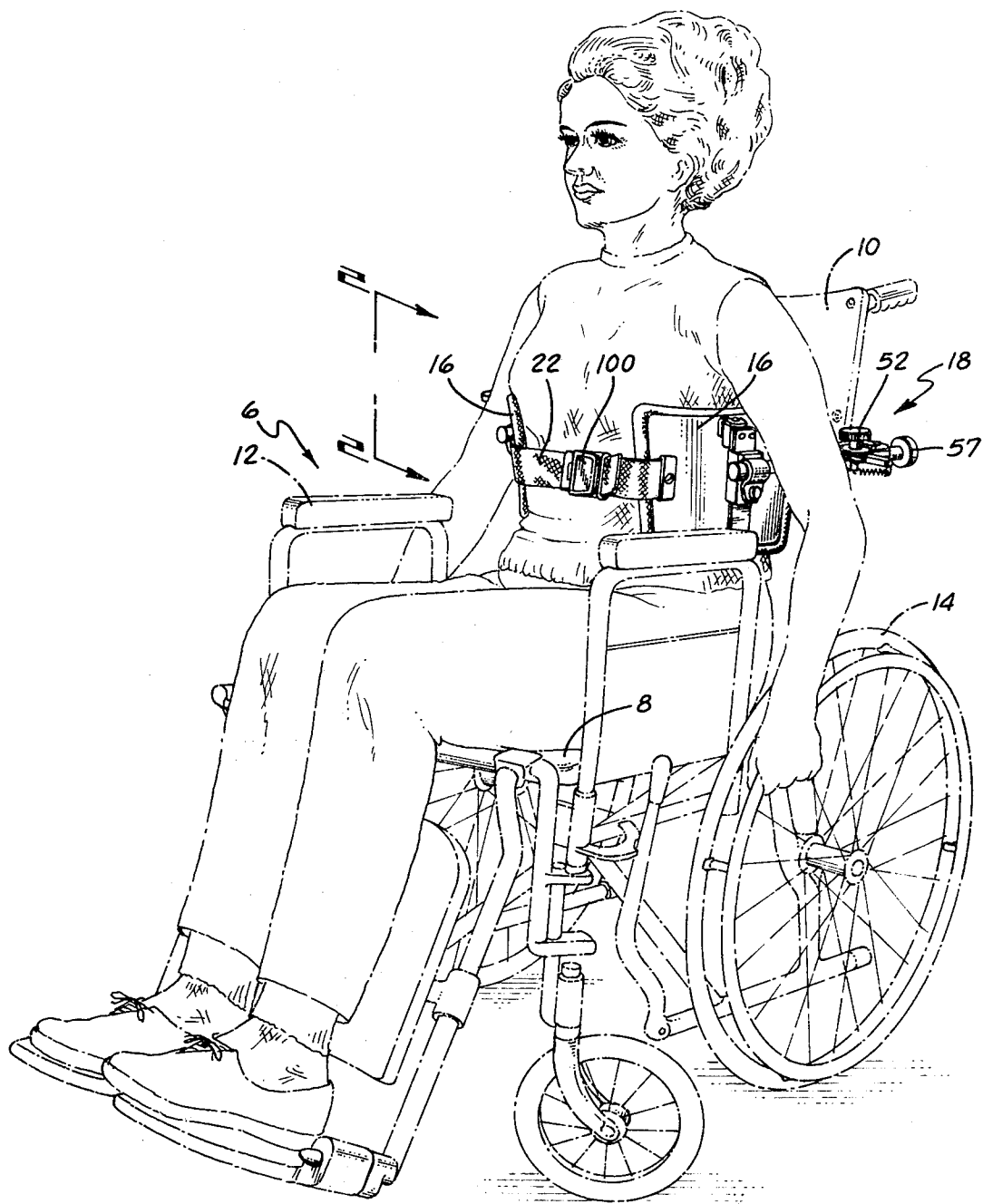


FIG. 1

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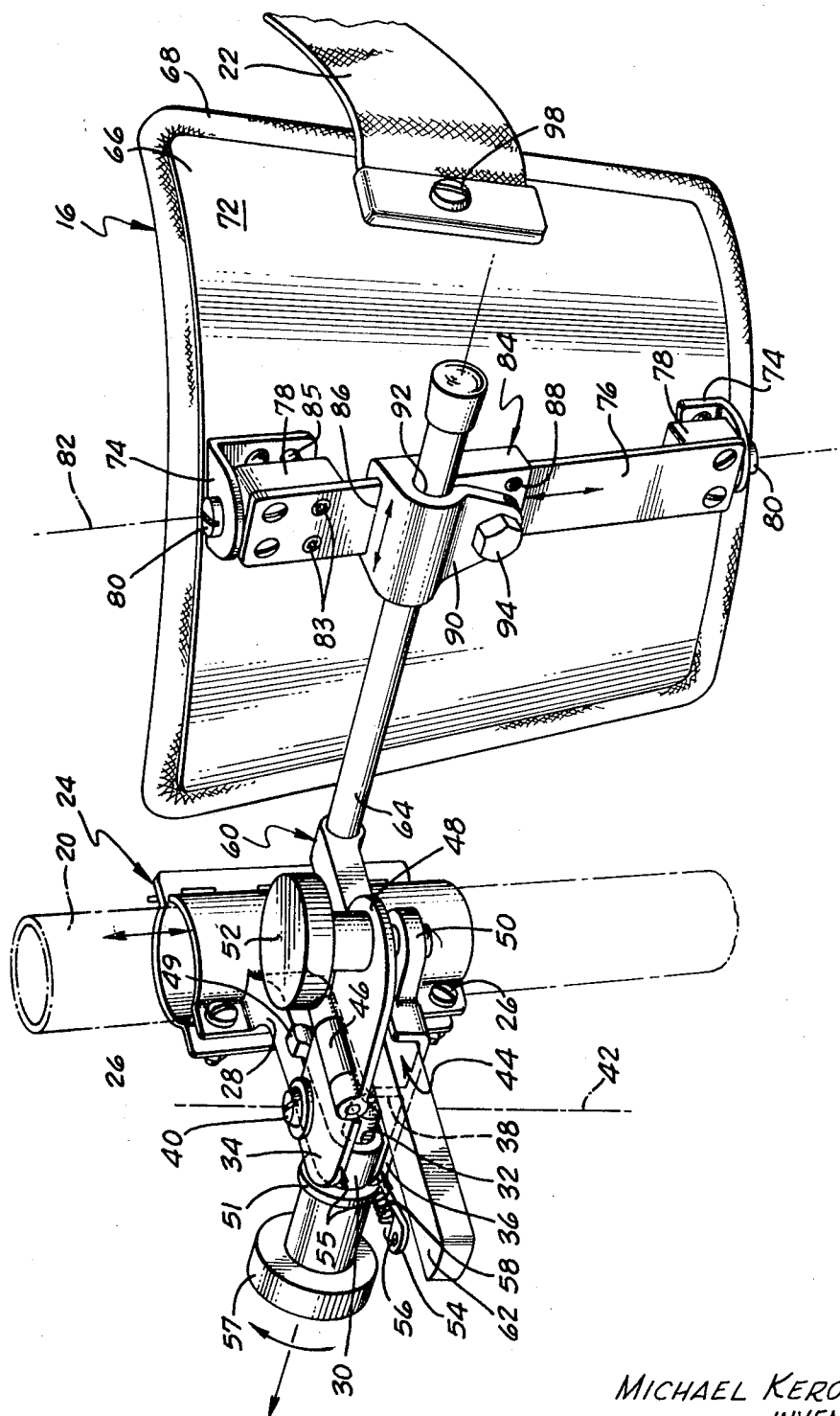


FIG. 2

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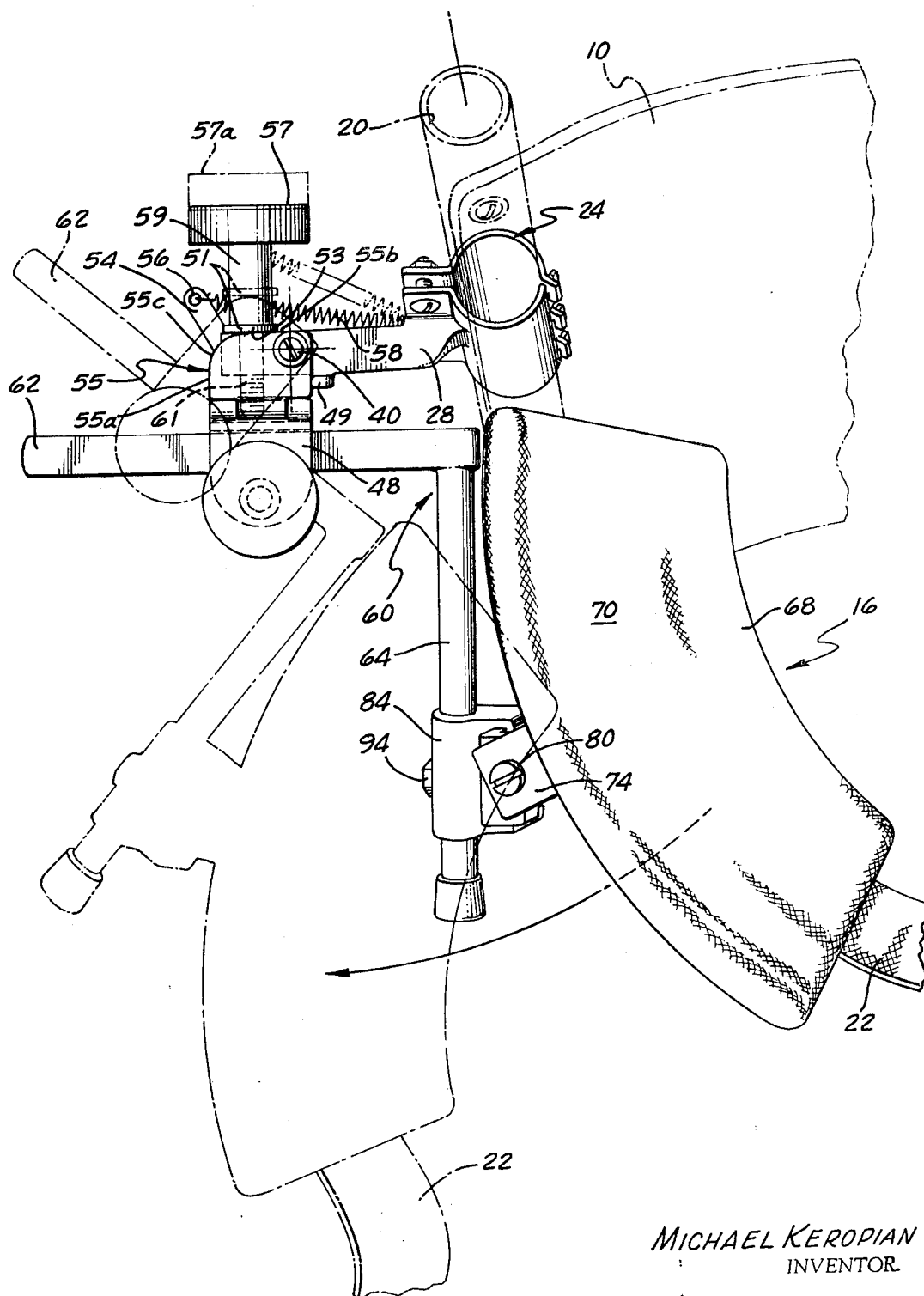


FIG. 3

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TRUNK SUPPORT FOR SITTING PATIENTS

BACKGROUND OF THE INVENTION

Infirm, injured or paralyzed patients frequently require support for their trunks while in a sitting position, say in a wheelchair. Curvature or deformity of the patient's spine may take place due to improper support, insufficient strength or general infirmity of the patient. Additionally, paralyzed patients unable to maintain a sitting position unless restrained and properly supported can be placed in chairs by preventing their trunks from slumping forward or sideward.

In the past patients were usually strapped into the chair and against the chair's back. Such strapping is inconvenient, particularly since it can cause undesirable pressure points on the patient's body, is difficult to apply and, most importantly, does not provide proper and adequate support for the patient's trunk. Nevertheless, the general lack of readily available other means has made them widely accepted.

SUMMARY OF THE INVENTION

The present invention provides support plates for laterally supporting a patient's trunk while in a sitting position. The plates are universally movable to permit adjustment of the plate position to patients of varying sizes and shapes, they can be opened to permit the patient to alight from or enter the chair without interference from the support plate, and they are returned into the exact same position each time they are applied to the patient's trunk without need for any adjustments. The plates also permit the patient to move while supported. The degree of movement can be adjusted as needed.

Briefly, the trunk support of the present invention comprises a pair of trunk support plates contoured to fit against the patient's trunk, and means for securing the plates to a seating structure such as a wheelchair. Means are further provided to universally adjust the spatial position of the support plates when in a trunk supporting position to adapt them for use with patients of different sizes and shapes. Releasable locking means permit the plates to be removed from and returned to their supporting positions. Stop means cooperating with the releasable locking means assure that the support plates are always returned into the same supporting position so that the amount of pressure applied by the plates to the patient's trunk remains constant as long as the plates are used on the same patient.

The support plates are mounted to be pivotable about a vertical axis over a limited arc to provide the patient with some freedom of motion while he is supported.

The initial setting or fitting of the support plates to a particular patient is done by highly skilled and experienced personnel such as a physical therapist or a physician. Thereafter, attendants, unskilled and inexperienced family members and the like can open and close the support plates. Each time the plates are closed, i.e., placed in their trunk supporting position, the initial setting is repeated. Maladjustments of the plates and consequent patient discomfort are thus eliminated. The elimination of tedious plate adjustments further significantly reduces the required attendant time for reapplying the plates.

In the presently preferred embodiment of the invention the plates are interconnected by suitable straps or belts to positively restrain the patient to the wheelchair, minimize support plate deflections when the patient's full weight is directed against one of the plates and to positively prevent the patient from falling forward.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a wheelchair provided with lateral trunk support plates constructed in accordance with the present invention;

FIG. 2 is a perspective, side elevational view of the trunk support plates as mounted to the chair's backrest and is taken on 2—2 of FIG. 1; and

FIG. 3 is a plan view of the trunk support illustrated in FIG. 1 and shows the trunk support plates in a semiopen position in phantom lines.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a conventional wheelchair 6 is, illustrated in phantom lines, comprises a sitting surface 8 and a backrest 10 for the patient, armrests 12, large drive wheels 14 and a pair of lateral trunk support plates 16. A mounting structure 18 secures each trunk support plate to an upright post 20 (shown in FIG. 2) of the backrest. A belt 22 interconnects the support plates and positively restrains the patient to the chair.

The support plates grasp the sides of the patient's trunk. They are contoured, i.e., concavely shaped to follow the exterior of the trunk, and limit or prevent movements of the trunk in the sideward and forward directions. In this manner the patient's trunk can be maintained in its proper position to prevent spine curvatures and limit or treat spine deformities.

Referring to FIGS. 2 and 3, the construction of trunk support plates 16 and mounting structure 18 is illustrated in greater detail. A clamp member 24 embraces post 20 of the chair's backrest 10 and is tightened thereagainst by threaded bolts 26. One-half of the clamp member includes a generally horizontally disposed mounting bar 28 which extends away from the clamp member and terminates in a free end 30 provided with a threaded aperture 32. A pair of spaced apart upper and lower bearing plates 34 and 36 are interconnected by an upright leg 38 and disposed adjacent the generally horizontal sides of mounting bar 28. A pivot pin 40 extends through a pair of aligned bores (not separately shown) in the upper and lower bearing plates and a bore extending vertically through mounting bar 28. The pivot pin secures the bearing plates to the mounting bar for pivotal movement of the plates with respect to the bar about a vertical axis 42.

The end of the lower bearing plate opposite pivot pin 40 is crimped, extends upwardly and, in conjunction with leg 38, defines as substantially horizontal, U-shaped channel 44. The end of upper bearing plate 34 opposite from pivot pin 40 defines a hinge 46 which mounts a tongue 48 pivotable towards and away from channel 44. A lug 50 extends from the lower bearing plate and includes a threaded aperture (not shown) engaged by a setscrew provided with a hand knob 52. The setscrew extends through a bore (not shown) in tongue 48 and forces the tongue against the channel 44 when it is tightened.

An extension 54 disposed at the side of the lower bearing plate 36 proximate mounting bar 28 projects from the lower bearing plate in a direction generally away from channel 44. The outer end of the extension includes an aperture 56 in which one end of helical tension spring 58 is anchored. The other end of the spring is anchored in a similar aperture (not separately shown) in clamp member 24. The spring biases the bearing plates in a clockwise direction, as viewed in FIGS. 2 and 3, about pivot pin 40.

Referring particularly to FIG. 3, the bearing plates also include a pair of perpendicular, outwardly oriented cam surfaces 55a and 55b interconnected by a rounded cam surface 55c. The cam surfaces are eccentric with respect to pivot axis 42. A setscrew 57 provided with a knurled hand knob has a large diameter shank 59 and a shaft 61 threaded into aperture 32 at free end 30 of mounting bar 28. A shoulder 53 is defined by shank 59 and threaded shaft 61 and faces cam surfaces 55. A washer 51 can be interposed between shoulder 53 and the cam surfaces to prevent undue wear.

Tension spring 58 constantly biases bearing plates 34, 36 in a counterclockwise direction until one of the cam surfaces 55 engages setscrew shoulder 53. Unthreading of the setscrew with hand knob 57, say to the position shown in phantom lines in FIG. 3 and identified with reference numeral 57a, permits spring 58 to pivot the bearing plates about the pivot pin 40 until curved cam surface 55c engages setscrew shoulder 53.

Additional back off of the setscrew permits the bearing plates to pivot further through substantially 90° until bearing surface 55a engages the setscrew shoulder.

Tightening of the hand knob 57 applies a force to the bearing plate cam surface opposing the spring force and thereby pivots the bearing plates about pivot pin 40 in a counterclockwise direction as viewed in FIG. 3. A stop bar 49 is secured to mounting bar 28, extends above and below the generally horizontal mounting bar surfaces and defines a limiting position beyond which the bearing plates cannot pivot when hand knob 57 is tightened. Each time the stop bar engages the bearing plates; they are, therefore, in exactly the same position for advantages more fully pointed out hereinafter.

As an alternative to the illustrated and above-described coaction between the spring and the cam surface and the shoulder of hand knob 57 permitting a singlehanded opening and closing of the support plates, a suitable threaded interengagement between the bearing plates, the hand knob 57 and the mounting bar can be provided. The support plates are then closed or opened by turning the hand knobs in one or the other direction.

Referring again to FIGS. 2 and 3, a generally L-shaped support plate mounting bracket 60 includes a first leg 62 having a rectangular cross section and a perpendicular, cylindrical second leg 64. The first leg is axially slidably disposed in channel 44 for lateral adjustments of the bracket's position and can be clamped against lower bearing plate 36 with tongue 48 by tightening hand knob setscrew 52. The L-shaped mounting bracket is thereby fixed with respect to the bearing plates whereby the bracket pivots about pivot pin 40 with the bearing plate.

Trunk support plates 16 are constructed of a relatively rigid, e.g. metallic, panel 66 arcuately shaped in a horizontal direction (generally parallel to the axis of cylindrical leg 64) for fitting the panel laterally against sides of the patient's trunk. Its arcuate extent is preferably at least about 10° and its transverse, generally vertical height preferably exceeds the horizontal panel width to assure proper and comfortable trunk support for the patient when the support plates are in use. The concave side of the panels are padded with a soft, resilient material 68 such as foam rubber covered with a webbing, plastic sheets or soft leather. The exposed surface 70 of the soft padding is thus also concavely arcuate in substantially the same manner as panel 66.

Mounted to the rear, convexly arcuate side 72 of panel 66 are a pair of spaced apart brackets 74 which include aligned apertures (not separately shown). A flat bar 76 provided with mounting blocks 78 at its ends is disposed between the brackets and threaded bolts or pivot pins 80 extending through the apertures in brackets 74, engage the mounting blocks and permit relative pivotal movement of the flat bar and trunk support plate 16 about a generally vertical axis 82 which is substantially parallel to the axis of the patient's trunk. The relative pivotal movements of the flat bar and the trunk support plates is limited by the interengagement of panel 66 and mounting blocks 78 and is adjustable by extending or retracting a pair of setscrews 83. The setscrews can be extended so that their ends 85 engage bracket 74 to thereby immovably fix the plates. By retracting the setscrews the pivotal movement of the plates about axis 82 can be suitably adjusted.

A slide member 84 has a recess 86 grasping the portion of flat bar 76 intermediate mounting blocks 78 and is thus retained to the flat bar while permitting the member to slidably move between the mounting blocks. Setscrews 88 disposed in the slide member can be tightened against the flat bar to lock the slide member to the bar at a desired position and prevent further movements of the member. The slide member also includes a clamp 90, preferably integrally constructed with the slide, which defines a cylindrical opening 92 seized to receive the cylindrical leg 64 of the L-shaped mounting bracket 60. A threaded bolt 94 is provided to tighten clamp 90 against the cylindrical leg, lock the slide member

with respect to the cylindrical leg and prevent further relative movements between the two.

It will now be apparent that trunk support plates 16 are universally adjustable along orthogonal horizontal axes by axially moving L-shaped bracket 60 along channel 44 or slide member 84 along cylindrical leg 64. By tightening hand knob setscrews 52 or 94 the plate can be locked in any desired position. In addition, the plate can be adjusted in a vertical direction by loosening setscrews 88 and sliding flat bar 76, and with it trunk support plates 16, along recess 86 of the slide member. Furthermore, an adjustable pivotal movement of the trunk support plates about pivot axis 82 is provided. The inclination of the pivot axis from the vertical (or horizontal) can be adjusted by loosening threaded bolt 94 and rotating the slide member and trunk support plates on cylindrical leg 64 of the L-shaped bracket 60.

Turning now to the use of the trunk support plates on a sitting patient, and referring to FIGS. 1 through 3, mounting brackets 24 associated with the trunk support plates are affixed to upright posts 20 of the wheelchair's backrest 10 and screws 26 are tightened to firmly secure the mounting bracket to the posts. Hand knob setscrews 52 are backed off and the rectangularly shaped leg 62 of cylindrical mounting brackets 60 are inserted in channels 44 so that cylindrical legs 64 of the L-shaped brackets are proximate the center of the chair.

Threaded bolts 94 of slide members 84 are backed off, the cylindrical legs are slipped past cylindrical openings 92 and the bolts are tightened to secure the mounting plates to the L-shaped bracket. Hand knob setscrews 57 are now backed off whereby tension springs 58 pivot bearing plates 34, 36, L-shaped brackets 60 and trunk support plates 16 in a clockwise direction (as viewed in FIG. 3) outwardly and away from the center of the chair into the position indicated in phantom lines in FIG. 3.

The patient is now free to enter the chair without interference from the trunk support plates. Once the patient is in a sitting position, hand knob setscrews 57 are tightened whereby the trunk support plates are moved inwardly towards the patient as previously described until bearing plates 34, 36 engage stop bar 49. An experienced and skilled person, such as a physical therapist, now adjusts the position of the trunk support plates in accordance with the needs of the patient. As already described, the spatial position of the trunk support plates is universally adjustable by loosening the various setscrews (but excluding hand knob setscrew 57) and correctly positioning the plate. After the trunk support plates are in the proper position all setscrews are firmly tightened to prevent any further relative movement between the trunk support plates, L-shaped brackets 60 and bearing plates 34, 36. The restraining belts 22 are secured to the convex sides 72 of panels 66 with threaded bolts 98 and they are tightened with a buckle 100 to positively restrain the patient to the chair.

If a patient is to alight from the wheelchair belt buckle 100 is opened and hand knob setscrews 57 are backed off whereby the trunk support plates 16 swing outwardly and clear the patient's exit path. After the patient reenters hand knob setscrews 57 are retightened until bearing plates 34, 36 engage stop bar 49 at which point the trunk support plates are in the same position in which they were originally placed. Readjustments and consequent adjustment errors and the like causing patient discomfort from improper placement of the trunk support plates are thereby prevented.

A second means of removing the trunk support plates from the side of the patient is by backing off of hand knob 52 and removing it from lug 50 which allows the raising of hinged tongue 46-48 so L-shaped bracket 60 can be removed from rectangular channel 44. This is particularly helpful for use with narrow wheelchairs where even a full opening of the trunk supports with hand knob 57 provides the patient with inadequate space to enter or alight from the wheelchair.

Although the trunk support plates are illustrated to be positioned in the same horizontal plane they can be offset if required. For example, in the treatment of spine deformities it

is sometimes desirable or necessary to place the support plates at substantially different vertical levels. In such instances, if the vertical spacing exceeds the vertical adjustability provided by flat bar 76 and slide member 84, clamp member 24 is released and moved upwardly or downwardly along upright post 20.

If a patient must alight sideways of the chair, by collapsing one of the armrests 12, the trunk support plate positioned on the opposite side of the collapsed armrest is not opened. Thus, in such instances only one of the hand knob setscrews 57 is backed off and, after the patient reentered the chair, tightened.

While the patient is disposed in the chair and restrained thereto by the trunk support plates the latter permit some degree of movement. Particularly the limited and adjustable pivotal movement of the plates about vertical pivot axis 82, which is disposed closely adjacent the support plates, gives the patient controlled latitude to move forwards or backward and, to a lesser degree, sideways. This permits rib movements during breathing and is further particularly desirable for wheelchair patients who move the chairs themselves with drive wheels 14.

What is claimed is:

1. A patient's trunk support for use on seating structures comprising a supporting plate for engaging a portion of the patient's trunk, means for connecting the plate to the support structure, adjustment means permitting adjustment of the spatial position of the plate with respect to the support structure and the patient's trunk, means permitting movement of the plate from a first position supporting the patient's trunk to a second, open position permitting the patient to enter and alight from the support structure, and stop means limiting movement of the plate when in the first position, whereby a precise positioning of the support plate relative to the trunk is attained without resetting of the adjustment means each time the plate is applied to the patient's trunk.

2. A trunk support according to claim 1 including means for biasing the support plate in one direction, means limiting the biased movement of the plate, and means for movement of the plate in a direction opposite to the biased movement thereof.

3. A trunk support according to claim 1 wherein the adjustment means comprises means for moving the support plate in at least three transverse axes, and means permitting pivotal movements of the support plate about respective axes parallel and transverse to the axis of the patient's trunk.

4. Apparatus according to claim 1 including means for locking the plate in the first position.

5. A trunk support for attachment to chairs and the like seating structures comprising a pair of opposite support plates for laterally supporting a patient's trunk, means for mounting the plates to the seating structure, means permitting independent pivotal movement of the plates about spaced apart axes generally parallel to the patient's trunk, means for independently spatially adjusting the position of the support plates with respect to the seating structure to enable use of the trunk support with patients of varying shapes and sizes, and plate opening means coupled to the mounting means for moving at least one of the support plates out of its trunk supporting position to enable the patient to enter and alight from the seating structure.

6. A trunk support according to claim 5 wherein the plate opening means includes means determining the trunk supporting position of the support plate and preventing movement of the support plate past such trunk supporting position.

7. A trunk support according to claim 6 including means for demountably securing the trunk support to the seating structure, and means independent of the securing means for moving the support plate substantially parallel to the pivot axis to provide further adjustability of the support plate relative to the seating structure and the patient's trunk.

8. A trunk support according to claim 7 wherein the pivot axis and the means for adjusting the plate parallel to the pivot axis are positioned closely adjacent the support plate, and wherein the trunk support further includes means also closely adjacent the support plate for pivoting the plate about a second axis oriented transversely to the first axis.

9. A trunk support according to claim 5 including means for adjusting the magnitude of the pivotal movement of the plate.

10. A trunk support comprising a contoured trunk support plate for placement against a patient's trunk, the support plate being movable into and out of its trunk support position, plate mounting means for mounting the plate to a seating structure, means permitting limited pivotal motion of the plate about an axis substantially parallel to and disposed closely adjacent the plate and the patient's trunk, vertical adjustment means permitting the raising and lowering of the plate in the direction of the patient's trunk, means for adjusting the position of the support plate in transverse directions substantially perpendicular to the trunk axis, means determining the trunk supporting position of the support plate, and means for locking the support plate in its trunk supporting position.

11. A trunk support according to claim 10 and having cam means associated with the locking means for moving the plate toward its trunk supporting position and determining the maximum movement of the plate between the trunk supporting position and an open position.

12. In a seating structure for patients with infirm trunks having a sitting surface, support means for the surface, and upwardly extending backrest means connected with the sitting surface, the improvement comprising: a pair of trunk support plates arranged laterally of the patient's trunk for limiting movements of the trunk and maintaining the trunk in an essentially upright position, means for securing each support plate to the backrest, means permitting movement of at least one of the plates toward and away from the trunk, means for arresting movement of the plates towards the trunk in a predetermined trunk supporting position laterally of the patient's trunk, means for releasably locking the plates in the predetermined position, and means permitting independent adjustment of the plate positions relative to the seating structure when the plates are locked in said predetermined trunk supporting position.

13. A structure according to claim 12 wherein the means permitting movement includes means for pivoting at least one of the plates about a generally upright axis, and wherein the adjustment means includes pivot means permitting limited pivotal movement of the plate about an axis generally parallel to the patient's trunk, the pivot means being positioned closely adjacent the plate.

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