United States Patent [19]

Propst

[11] **3,763,507**

[45] **Oct. 9, 1973**

[54] **PEDIATRIC BED**

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[73] Assignee: **Herman Miller Inc.,** Zeeland, Mich.

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[21] Appl. No.: **175,505**

[52] **U.S. Cl.** **5/100,** 5/99

[51] **Int. Cl.** **A47c 27/08,** A47d 9/00

[58] **Field of Search** 5/11, 63, 81, 91, 5/99, 100

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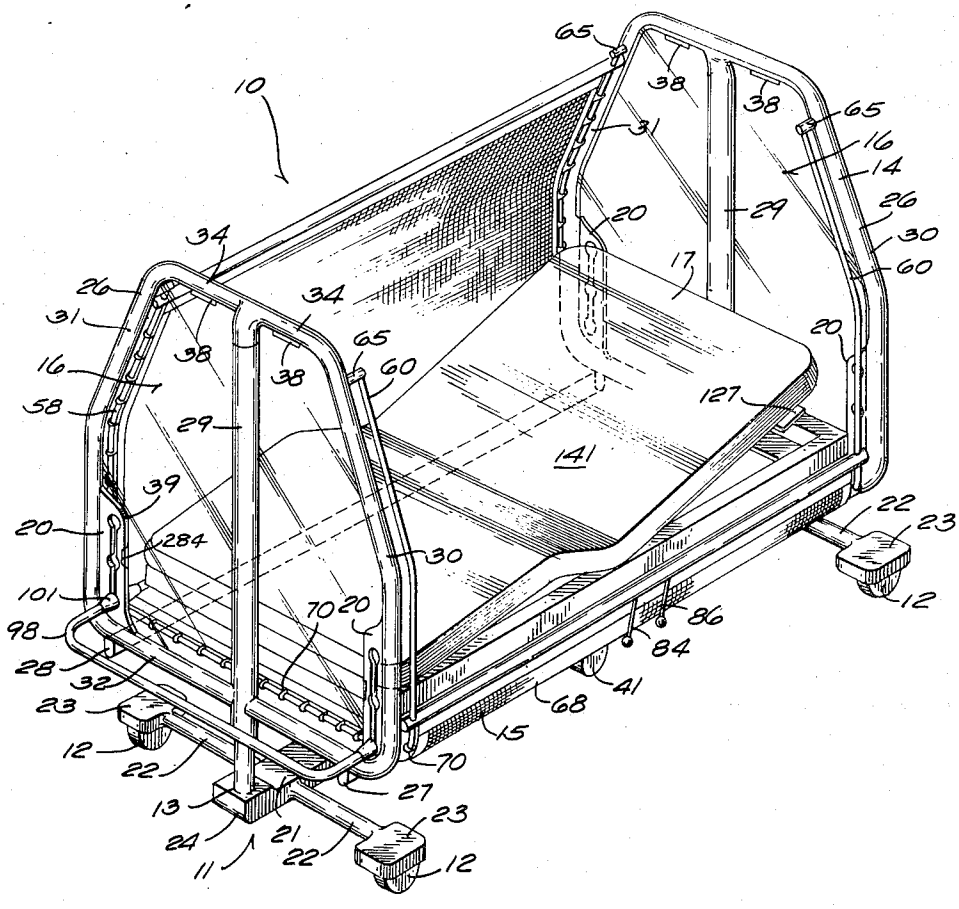
Primary Examiner—Casmir A. Nunberg

Attorney—Price, Heneveld, Huizenga & Cooper

[57] **ABSTRACT**

A bed platform is suspended within a support frame having transparent and removable plastic end walls and plastic mesh sides slidable on a Tambour track bv-tween raised and lowered positions. As the sides a9e raised, they slope inwardly over and above the platform to discourage climbing. The support frame is mounted on a caster supported base having upstanding end posts attached to the frame and aujustable height-wise by a motor driven lift. The platform is supported on thv ends of thv frame and is adjustable for Trendelenburg and reversed Trendelenburg positioning. Affixed to the platform is a mattress frame which includes adjustable and pivotal portions for Gatch positioning. The mattress is molded with a shell-like configuration to fit over the mattress and support frame and includes living hinges to permit folding into various Gatch positions. It also includes grippers along its underside for positive grip sheet placement.

43 Claims, 36 Drawing Figures



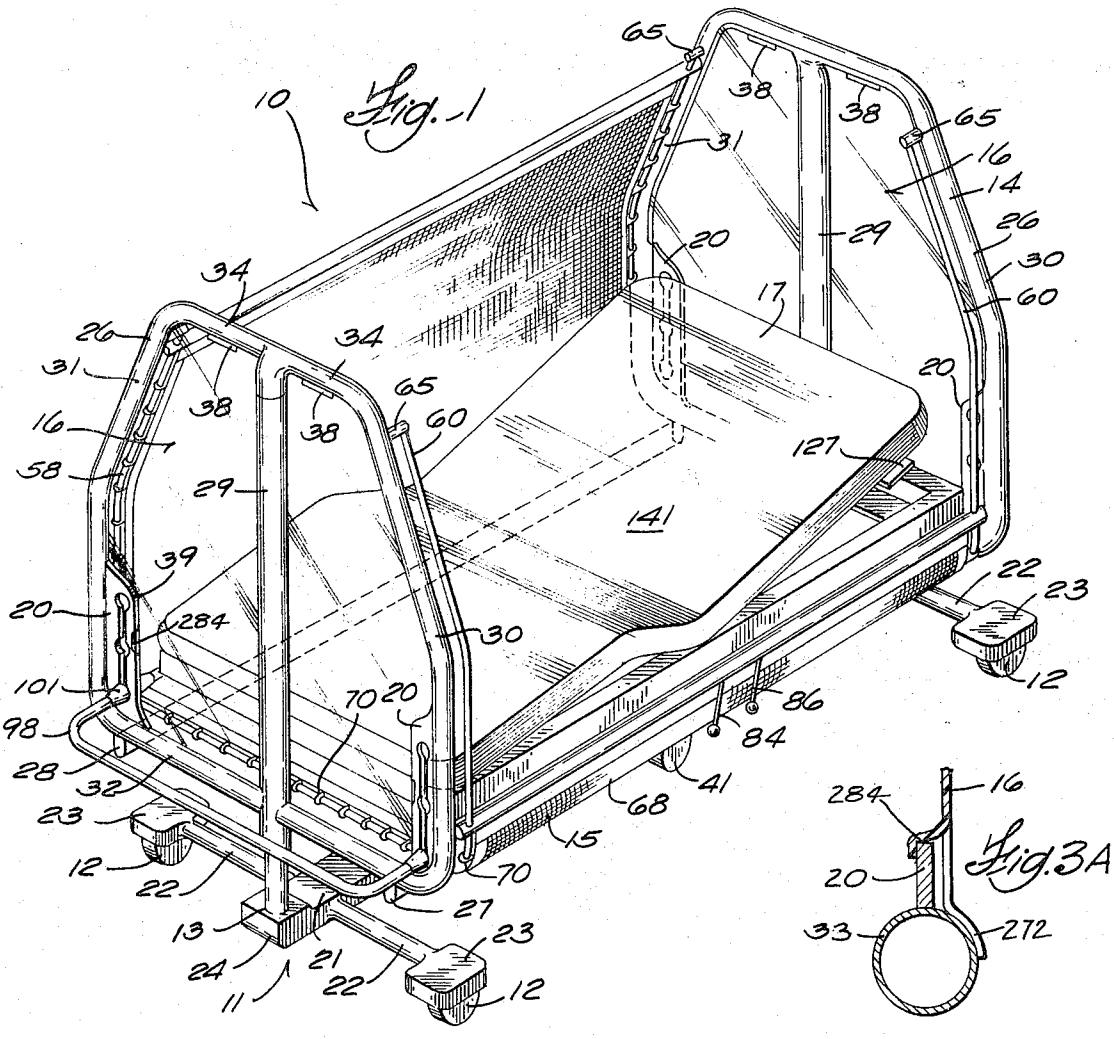

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Fig. 1

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Fig. 3A

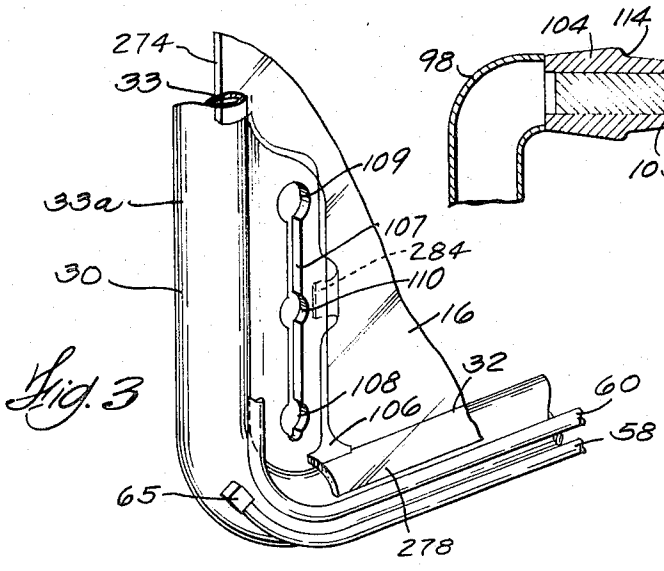
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Fig. 3

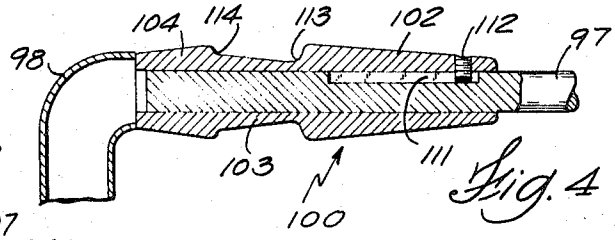
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Fig. 4

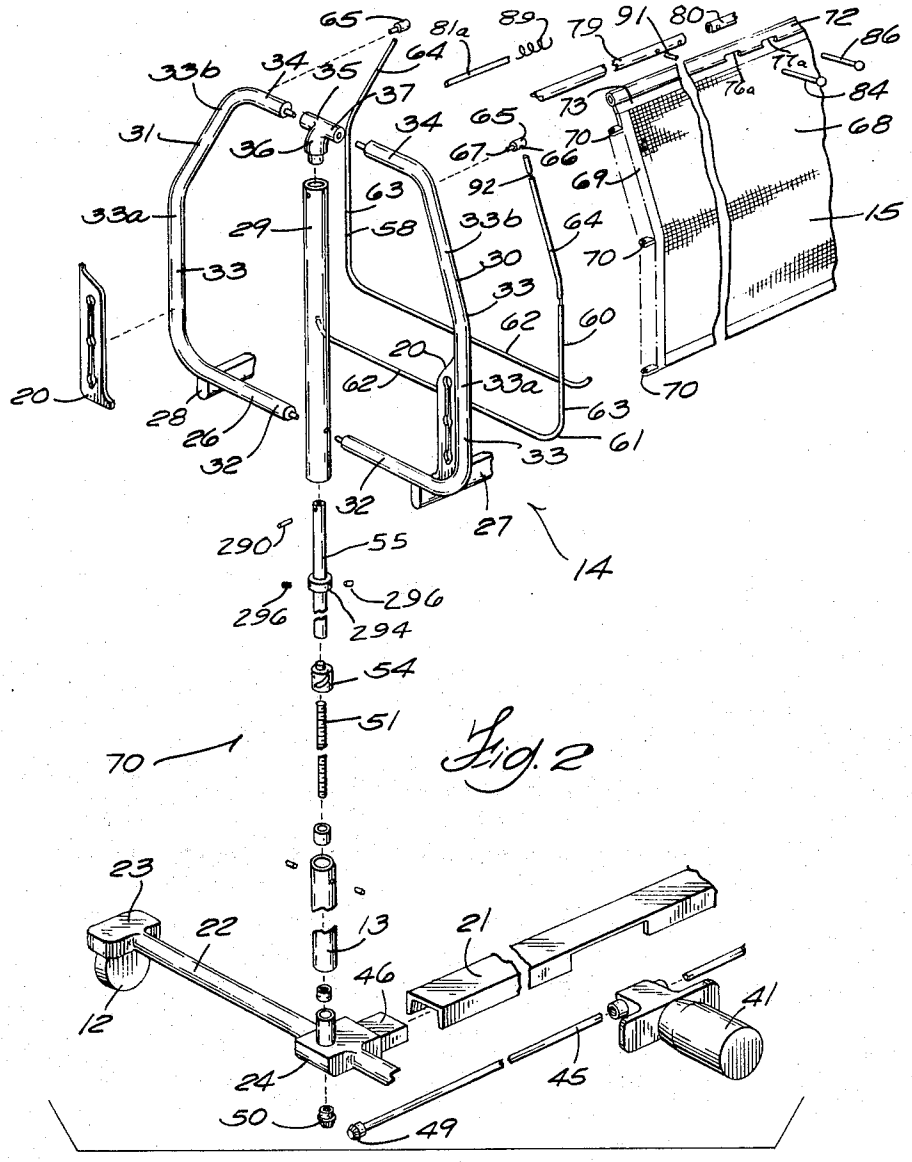


Fig. 2

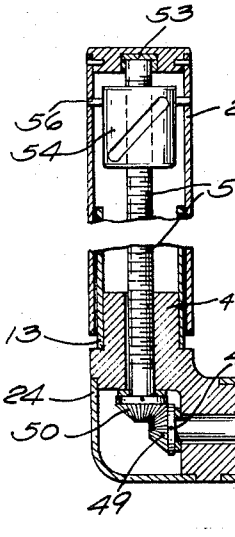


Fig. 5

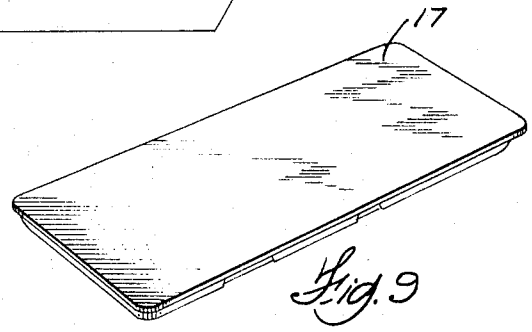


Fig. 9

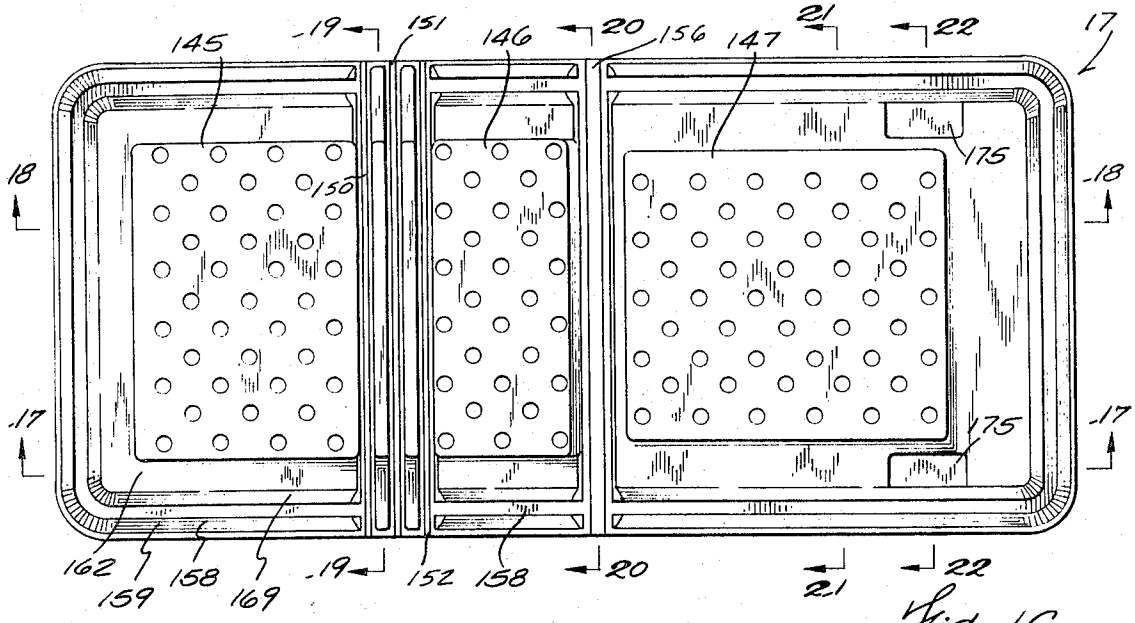


Fig. 16

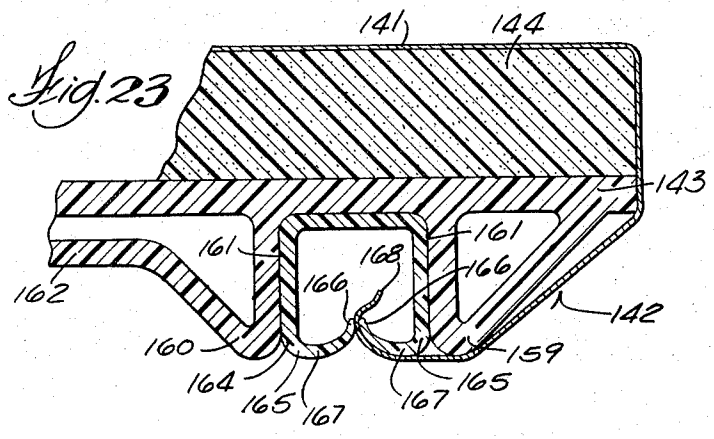


Fig. 23

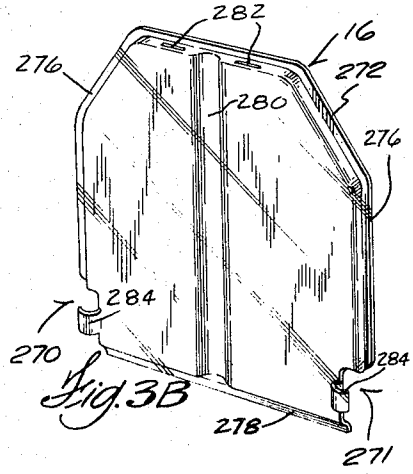


Fig. 3B

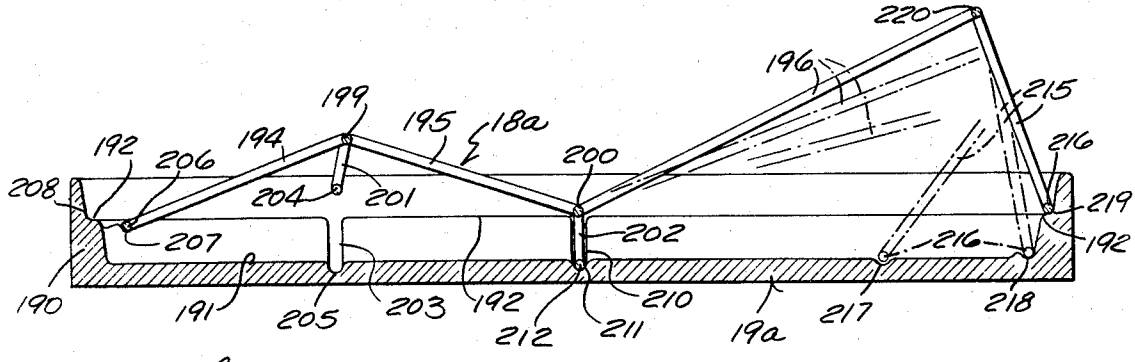
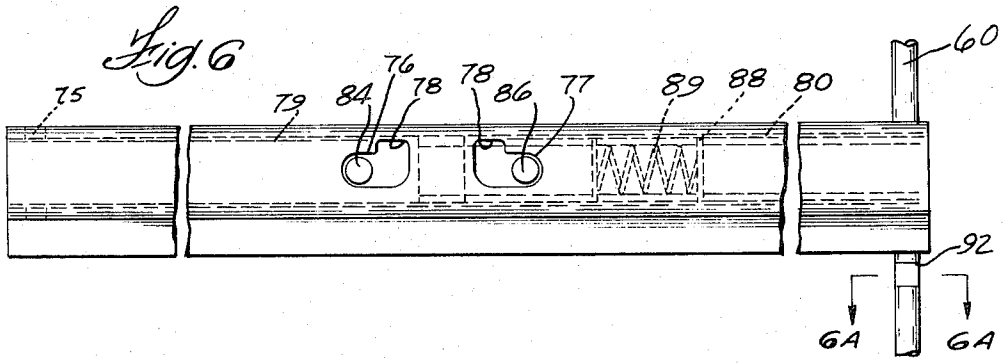
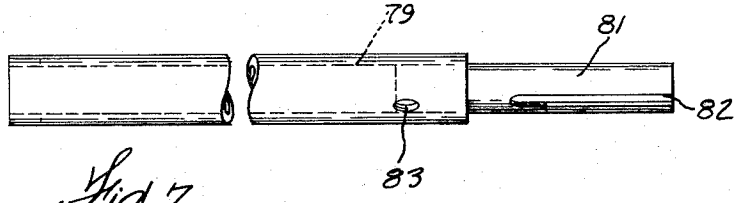


Fig. 32

Fig. 6





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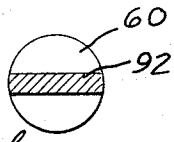


Fig. 6A

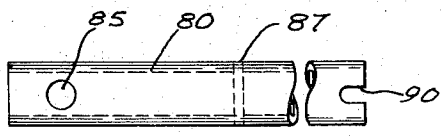


Fig. 8

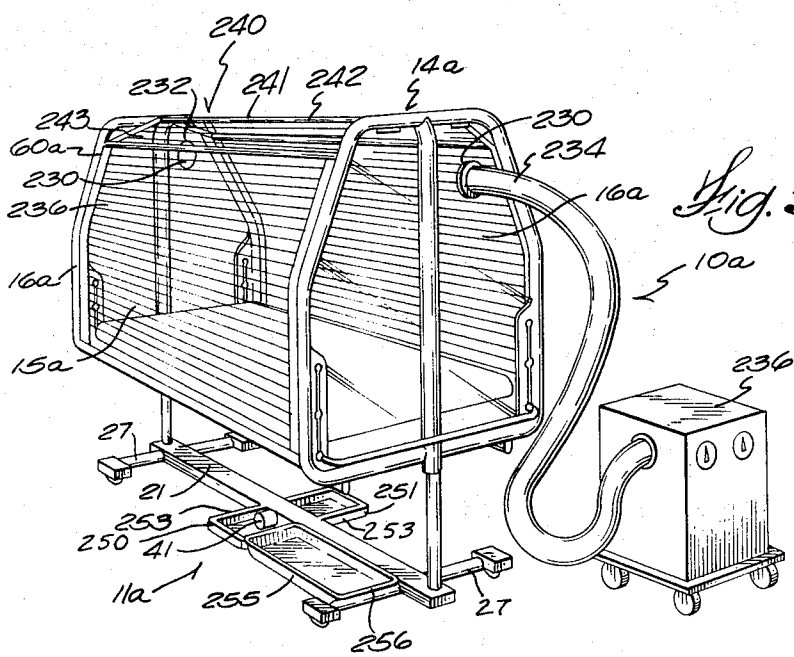
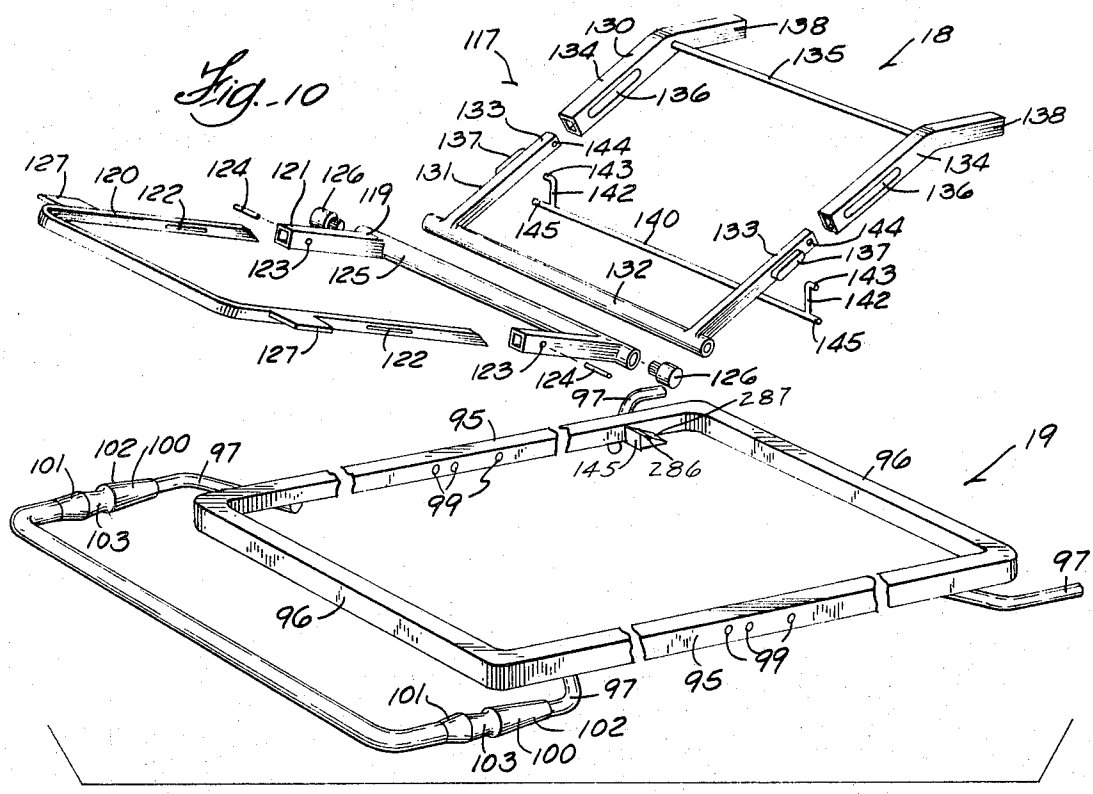
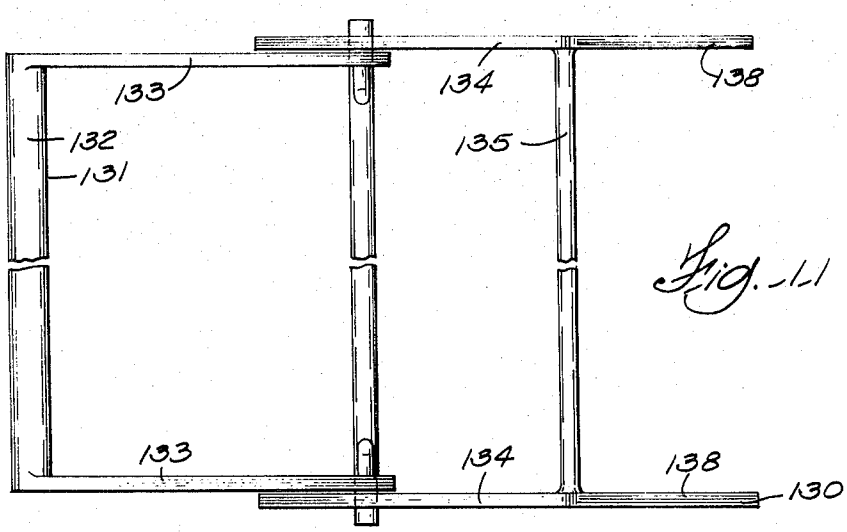


Fig. 33

Fig. 10





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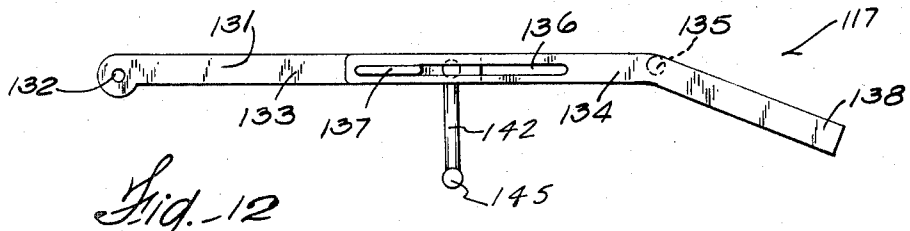

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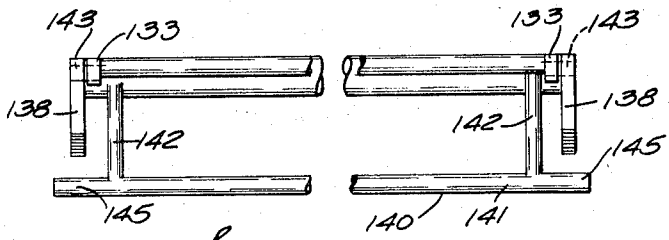

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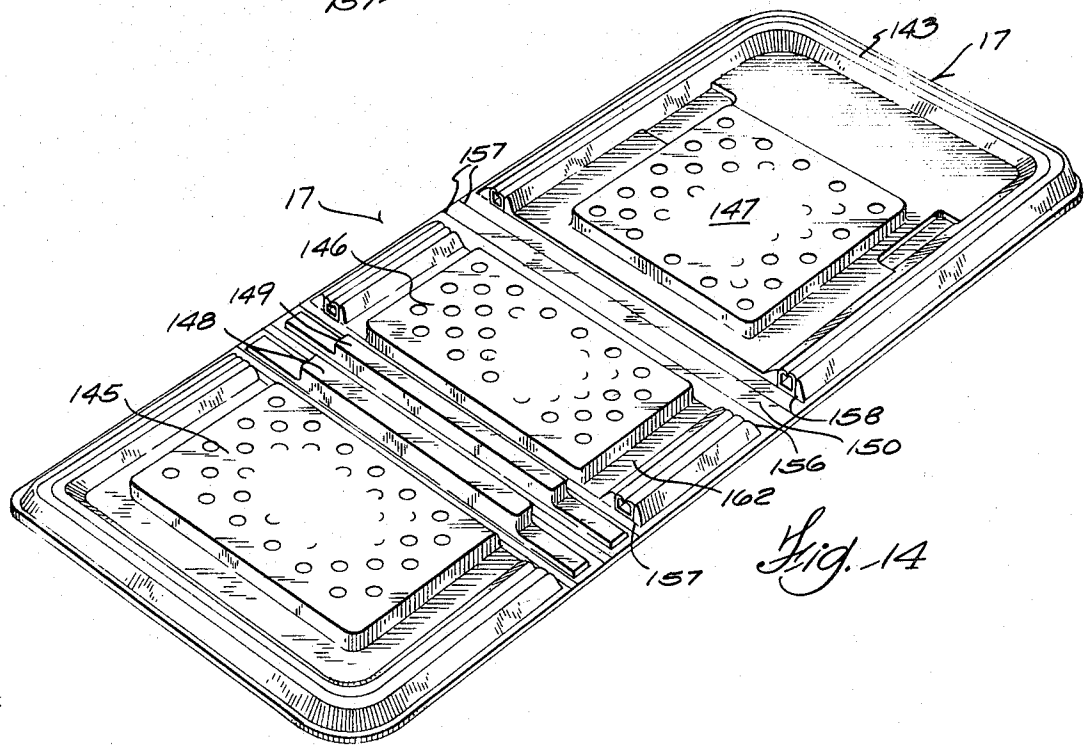

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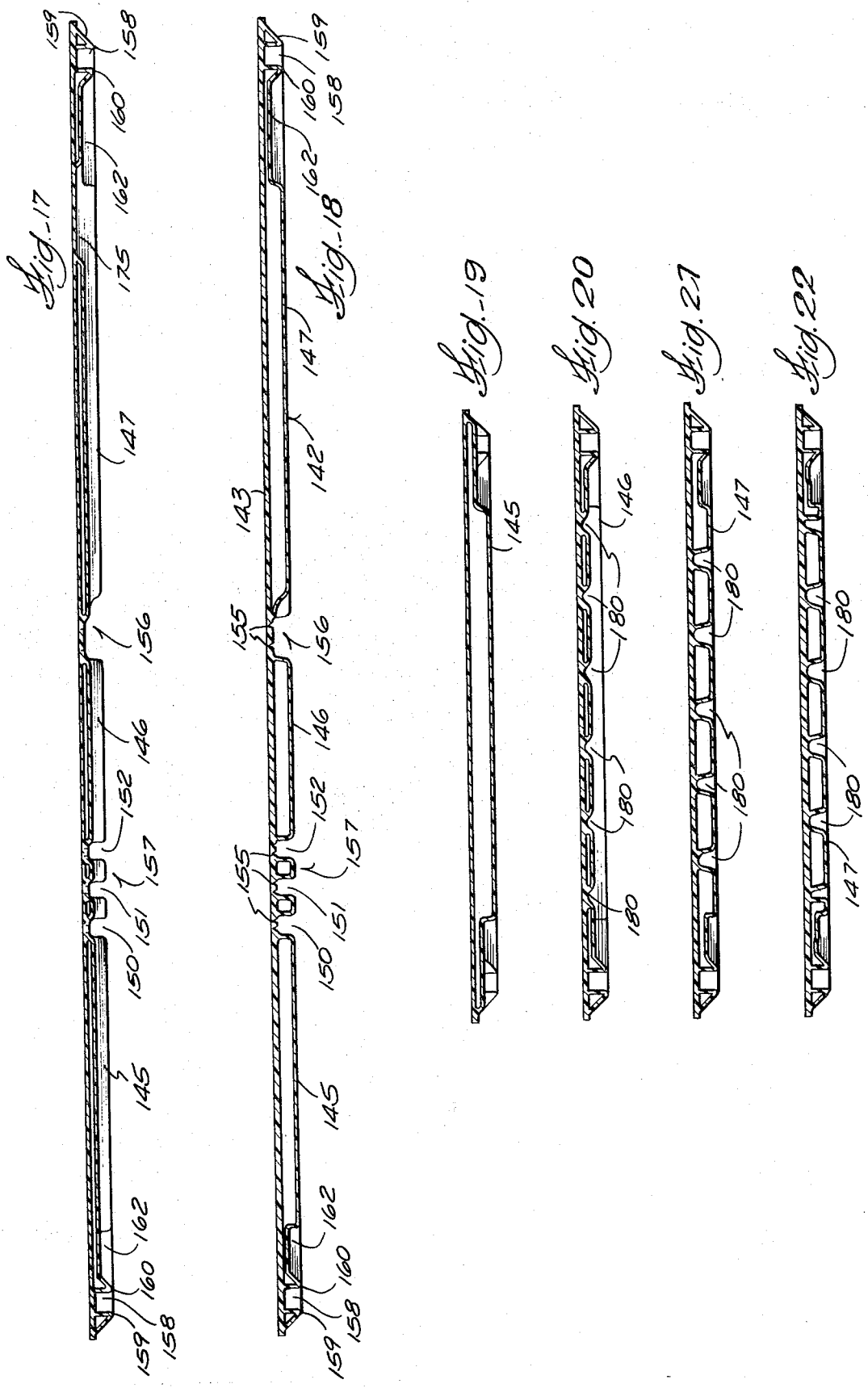
Fig. 17
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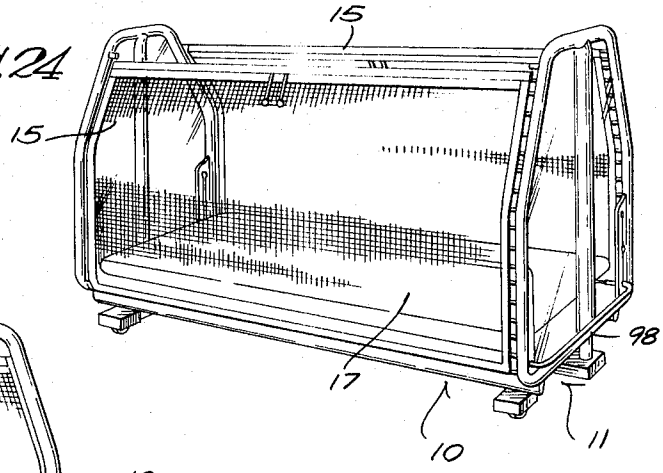


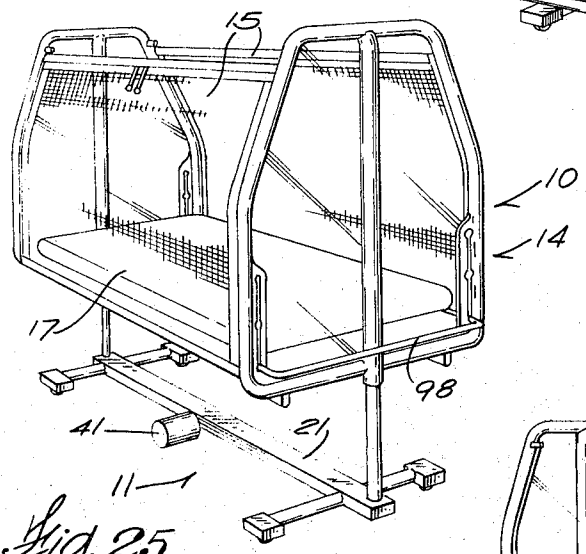


Fig. 25

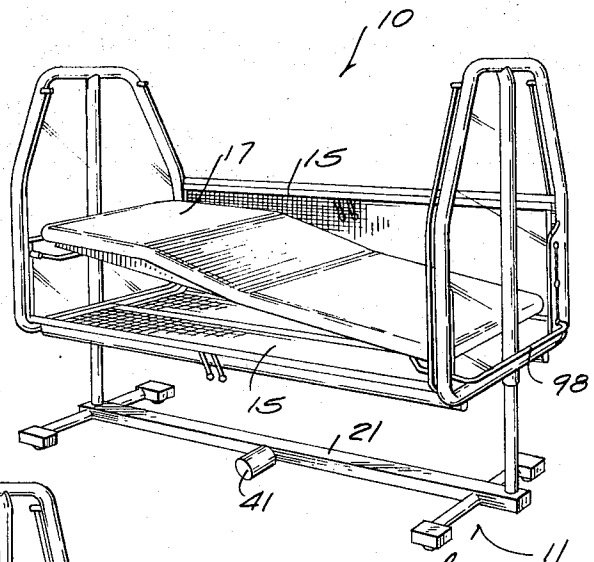
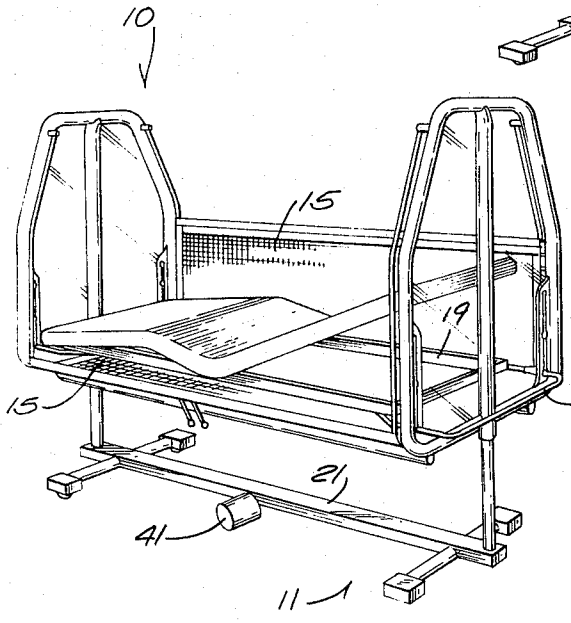


Fig. 26



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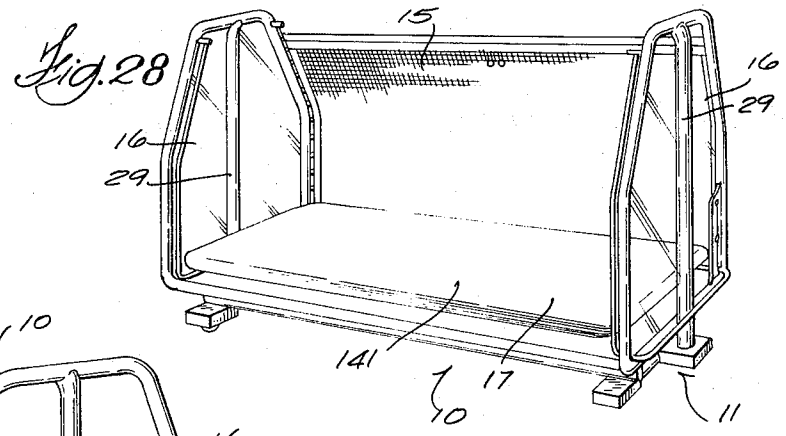
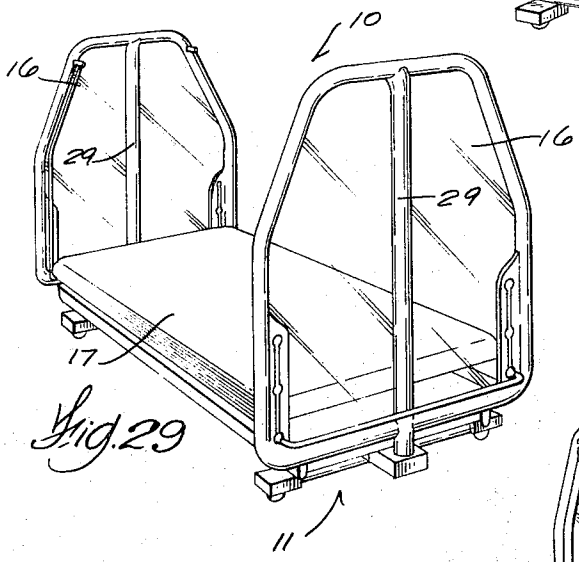


Fig. 28



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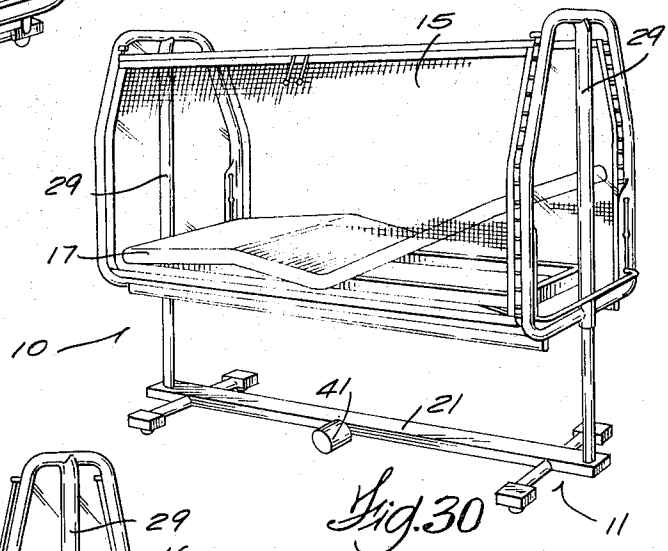

Fig. 30

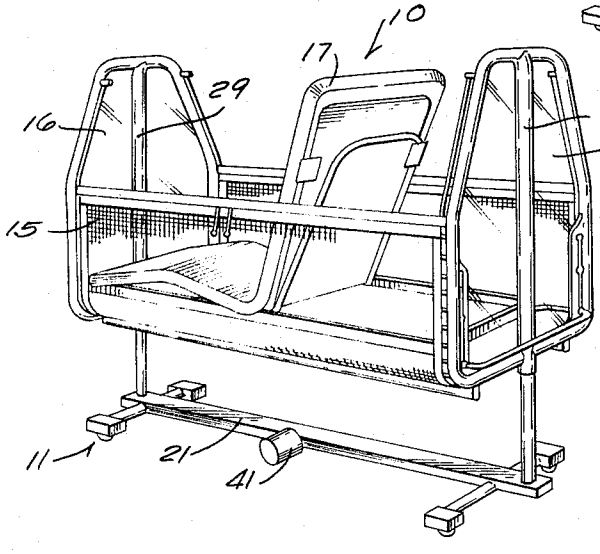

Fig. 31

PEDIATRIC BED

BACKGROUND OF THE INVENTION

This invention pertains to a pediatric bed, and more particularly to an improved versatile bed for use in child care centers such as hospitals.

Hospital beds or cribs for children have undergone little or no change over the years and indeed, applicant is unaware of any prior art on the market today which is versatile enough to be utilized properly as a crib or youth bed. Basically, the type of structure present today for young children is the traditional stainless steel or chrome plated cage called a crib. This in and of itself is one major disadvantage of present bed construction since a young patient admitted to the hospital is frequently quite frightened. Placing him in a cage type crib does little to reassure him or calm his fears. With regards to beds available for slightly larger children wherein a crib is unfeasible, present proposals call for a bed very similar to that used for adults simply modified slightly as to its size. One important overall disadvantage then is the lack of a bed which will accommodate both infants and youths. As a result, a pediatric department is faced with either buying a crib, a youth bed, or both in order to meet its needs. With the advent of over-crowded hospitals and the associated demand on floor space within hospitals, this is a luxury which can be ill afforded. Since the need is never completely constant within a pediatric department, the requirement of two different types of beds or cribs not only greatly increases the overall cost factor, but puts a demand on storage space or in the alternative the non-utilization of floor space. Thus, there is an extreme need today for a pediatric bed which is serviceable as a crib for the tiniest infant to a bed which is likewise serviceable for an older youth.

Another significant disadvantage of the prior art today is the lack of versatile adjustment as to height and positioning. While it is old to provide a bed having sides adjustable with regards to height, they are generally difficult to handle, and tend to jam when being raised or lowered. Also, the latching mechanism is many times within the reach of the patient, a potentially dangerous situation especially in regards to children. A second disadvantage of present proposals in this regard is the difficulties encountered in height adjustment. A bed which is utilized for both a tiny infant and an older child must be adjustable height-wise within a wide range. Applicant is unaware of any prior art child's bed that can be quickly and efficiently raised or lowered from the floor to an adult height electrically. Other important positionable adjustments include Trendelenburg positioning and Gatch positioning. Applicant is unaware of any pediatric bed which combines all of these adjustments in a simple to operate and economical fashion. Although it is old to provide a bed having one or more of these types of adjustments possible, additional disadvantages with these types of beds is their inability to be adjusted longitudinally to adapt to various sized individuals. The growth rate of an individual is a maximum in his younger years and thus, a child's bed adjustable for Gatch positioning, should also be adjustable so that the Gatch positioning can be varied to accommodate a child having various sized backs, legs and central body portions. That is, the distance in children from the foot to the knee; the knee to the waist; and the waist to the head can vary greatly.

Applicant is unaware of any child's bed which provides in addition to Gatch positioning, an adjustment for the various dimensions described. Thus, there is a need today for a pediatric crib which can be quickly and easily adjusted with respect to height, Trendelenburg positioning and Gatch positioning.

Yet another major disadvantage in existing proposals is that they are generally comprised of bars or tubes which have various drawbacks. To begin with, they affect the overall visibility into and out of the bed. This is distracting to the child as well as the nurse tending the child since they cannot always ascertain the exact status of the child in the bed from their various work positions in and around the bed. Also, bars and tubes present a difficult and time consuming cleaning problem. Furthermore, if the pediatric bed is to be utilized for small infants, there must be some assurance that the infant cannot extricate himself from within the confines of the bed and possibly injure himself in the fall. Thus, there is a need for a pediatric crib or bed which can be conveniently and yet positively enclosed to prevent a child from climbing out under normal circumstances. On the other hand, the bed must be adaptable to apply or attach orthopedic appliances or portable support environments such as oxygen tents thereto. Other orthepedic appliances such as traction equipment generally requires projections of the equipment past the extremities of the bed. Applicant is unaware of any pediatric bed which has easy to remove end walls which when being used are transparent to permit clear vision into the bed. Other disadvantages with present beds constructed of bars and tubular elements is their tendency to injure the child when he becomes frustrated or during excessive play strikes his head or hand against the tube elements. Applicant is unaware of a prior art bed having yieldable mesh siding which permits clear vision therethrough but prevents injury under normal circumstances and use.

Yet other drawbacks lie in the mattress pans and mattresses which are generally heavy and difficult to raise when it is desired to place the patient in a sitting position. In fact the weight alone of existing proposals make them difficult and clumsy for a nurse to move around. Finally, even through applicant is unaware of any present proposal which has any significant versatility to meet present day demands, those that do attempt to provide some versatility do so at very high costs. Since hospitals are in an era of spiraling costs, this is no small consideration.

Thus, there is a need today for a pediatric bed which has extreme versatility in both its utilization and adjustability while at the same time presenting an attractive looking unit at a cost that is not prohibitive.

SUMMARY OF INVENTION

In accordance with this invention, a novel and versatile pediatric bed is comprised of a platform means having a mattress affixed thereto, the platform means is suspended by a support frame which includes a pair of end walls and adjustable sides. The support frame is suspended from a caster mounted base and is adjustable height-wise by a lift mechanism.

In preferred aspects, the side and end walls are transparent to permit clear peripheral vision into and out of the bed with the end walls being removable to facilitate the attachment of external orthopedic equipment. The side walls preferably slant inwardly when in their ex-

treme upper position to discourage and inhibit an infant from climbing out of the bed when it is utilized as a crib. In other preferred aspects, the platform is adjustable for Trendelenburg positioning while the mattress is affixed to an auxiliary frame mounted on the platform which is adjustable for Gatch positioning. All components are comprised of aluminum or plastic to minimize its weight and make it easy to clean.

A principal advantage of this invention is its complete versatility for utilization as a crib, playpen or youth bed at varying heights.

Additional advantages provided by this invention is the versatility provided by this bed which provides Trendelenburg and Gatch positioning while at the same time providing an attractive overall appealing package of relatively light-weight and low cost. The package is attractive both in appearance for the sake of the user as well as its overall durability.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective fiew of the pediatric bed provided by this invention;

FIG. 2 is a fragmentary view of portions of the bed shown in FIG. 1 shown in an exploded perspective;

FIG. 3 is a perspective view of one of the Trendelenburg plates utilized in FIG. 1;

FIG. 3A is a cross sectional view taken along line 3A—3A in FIG. 3;

FIG. 3B is a perspective view of the end panel provided by this invention;

FIG. 4 is a side view of the handle assembly utilized in connection with the Trendelenburg plate shown in FIG. 3;

FIG. 5 is an elevation view shown in cross section of the platform height adjustment mechanism provided by this invention;

FIG. 6 is a fragmentary view of the sides and latch mechanism provided by this invention;

FIG. 6A is a cross sectional view taken along line 6A—6A in FIG. 6;

FIG. 7 is an elevation view of one of the telescoping latch tubes shown in FIG. 6;

FIG. 8 is an elevation view of another of the telescoping latch tubes shown in FIG. 6;

FIG. 9 is a perspective view of the mattress provided by this invention;

FIG. 10 is an exploded perspective view of the mattress frame and platform provided by this invention;

FIG. 11 is a plan view of the mattress frame shown in FIG. 10;

FIG. 12 is a side elevation view of the frame shown in FIG. 11;

FIG. 13 is an end view of the frame shown in FIGS. 11 and 12;

FIG. 14 is a perspective view of the bottom of the mattress shown in FIG. 9;

FIG. 15 is a side view partially cutaway to illustrate the mattress shown in FIG. 14 in a Gatch position;

FIG. 16 is a bottom view of the mattress shown in FIG. 14;

FIG. 17 is a cross sectional view takn along line 17—17 of FIG. 16;

FIG. 18 is a cross sectional view taken along line 18—18 of FIG. 16;

FIG. 19 is a cross sectional view taken along line 19—19 of FIG. 16;

FIG. 20 is a cross sectional view taken along line 20—20 of FIG. 16;

FIG. 21 is a cross sectional view taken along line 21—21 of FIG. 16;

FIG. 22 is a cross sectional view taken along line 22—22 of FIG. 16;

FIG. 23 is a cross sectional view taken along line 23—23 of FIG. 16;

FIGS. 24–31 are perspective views of the bed provided by this invention illustrating the bed and sides in a variety of adjusted height, Trendelenburg and Gatch positioning;

FIG. 32 is an elevation view in cross section of an alternative mattress frame and platform construction; and

FIG. 33 is a perspective view similar to FIG. 1 of an alternative bed arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring briefly to FIGS. 1 and 10 of the drawings the bed 10 provided by this invention includes a mobile base 11 mounted on casters 12. Each end of the base includes an end post 13 from which is suspended a support frame 14 having a pair of sides 15 and end panels 16. A mattress 17 is mounted on a mattress frame 18 (FIG. 10) which is anchored to a mattress platform 19. Platform 19 is in turn suspended from support frame 14. Frame 18 is movable to various Gatch positions (one of which is shown in FIG. 1) while platform 19 is mounted to frame 13 through a plurality of Trendelenburg plates 20 to permit the platform to be oriented in Trendelenburg or reverse Trendelenburg positioning. Gatch positioning relates to the knee's-up, back-up positioning while Trendelenburg positioning relates to the overall slope of the mattress relative the horizontal. End panels 16 are removable to permit the utilization of traction or other orthopedic attachments while the upper portion of sides 15 are sloped inwardly when in a full up position to inhibit a child from climbing out.

Referring now in greater detail to FIGS. 1 and 2, mobile base 11 is shown comprised of a generally longitudinally extending channel or frame element 21 which extends the overall longitudinal length of the bed. A pair of horizontal legs 22 extend laterally out in opposite directions from channel 21 near each end and are anchored at their outer end to a caster 12. This construction provides a low profile base having a generally rectangular configuration with a caster at each corner to provide excellent stability for the bed. Casters 12 are journaled in an individual housing 23 in a conventional fashion and preferably include some type of manually releasable brake means (not shown) so that the bed can be positioned in a desired location and prevented from unintentional movement.

Extending generally vertically upwards from each end of channel member 21 is an end post 13 preferably having a tubular configuration. End posts 13 are adapted to telescope within corresponding portions of the support frame 14 from base 11. An elbow 24 (FIG. 5) interconnects each post 13 with the end of channel 21. Elbow 24 accommodates part of the lift mechanism which will be described in more detail hereinafter.

Continuing in detail with reference to FIGS. 1 and 2, support frame 14 includes a pair of identical end frames 26, 26 which are rigidly interconnected by a pair of longitudinally extending cross bars 27 and 28

spaced laterally from each other and welded or affixed in some other fashion to the underside of end frame **26, 26.** Each end frame **26** includes a central vertical post **29** which telescopes over end posts **13** for support of frame **14** by base **11.** The telescoping association between end posts **13** and frame posts **29** adds to the overall rigidity and stability of interconnected end frames **26.**

Each end frame **26** in addition to post **29** is comprised of a pair of mating peripheral frame elements **30** and **31.** Elements **30** and **31** extend laterally with respect to the longitudinal axis of bed **10** and are connected to post **29** to form an overall end wall frame. Frame elements **30** and **31** include a lower generally horizontal portion **32** which is curved or shaped upwardly at its outer extremity into an upwardly extending portion **33.** Each portion includes a vertical portion **33*a*** extending from portion **32** terminating approximately half way with regard to the height of frame **14** where it is curved or formed into a second portion **33*b*** which is sloped inwardly back toward post **29.** The upper end of portion **33** coincides with the upper limit of support frame **14** wherein it is curved or shaped into an inwardly extending horizontal portion **34** which is directly terminated at post **29** and connected thereto conventionally by a fastener or as shown in FIG. **2,** an offset T-connector **35.** In order to keep bed **10** as light as possible, all of the tubing and frame elements are preferably comprised of aluminum or lightweight chrome-plated steel which are easy to keep clean.

The T-connector includes a leg portion **36** adapted to fit onto the upper portion of post **29** with the cross portion **37** offset forwardly from post **29** for receipt of the upper ends of frame elements **30** and **31.** The reason for this is to offset the plane defined by frame elements **30** and **31** in front of post **29** to permit the insertion of a one piece end wall **16** (FIG. **1**) within the confines of each pair of frame elements **30** and **31.** End walls **16** are preferably comprised of a clear-plastic such as polycarbonate and are adapted to be detachably mounted within end frames **26.** The detachable feature permits removal of the end walls in the event that external orthopedic equipment must be utilized such as traction equipment which extends from within the confines of support frame **14** externally thereof.

Referring to FIG. **3B,** each end panel **16** is symmetrical about its vertical center line and is shown to conform generally to the configuration of frame elements **30** and **31.** A pair of cut-out portions **270** and **271** permit the panel to be inserted around plates **20** which will be described in more detail hereinafter. The periphery of panel **16** includes a curved flange **272** comprised of upper portions **274,** side portions **276;** and bottom portion **278.** The curvature of flange **272** matches the radius of the end frame elements so that it nestles about the peripheral end frame elements to prevent the occupant of the bed from getting a grip on the end panels or possibly get his fingers wedged therebetween. A recess **280** extends vertically down the middle of panel **16** and is curved to nestle around end frame post **29.** The upper flange portion **274** includes an opening **282** on each side of recess **280** for receiving a pair of keeper plates **38** which depend from upper frame portions **34** to lock the panel to the frame. The cut-out portions **270** and **271** include a keeper tab **284** which is curved outwardly to fit around plate **20** as shown in FIGS. **1, 3** and **3A.**

To attach the panel to end frame **26,** one simply inserts the upper end or the inside of post **29** until keeper plates **38** are inserted into openings **282.** The lower portion is then gripped and flexed inwardly until tabs **284** clear plates **20** whereupon the panel is released and the tabs slip in behind plates **20** to secure the panel to the bed without requiring any mechanical fasteners. Recess **280** (FIG. **3B**) facilitates the inward flexing of the panel. To remove the panel, the reverse operation is preferred.

As described briefly earlier, support frame **14** is adapted to support platform **19** which in turn supports mattress frame **18** (FIGS. **1** and **2**). Thus, frame **14** essentially forms a shell or enclosure with ends closed by panels **16** and sides selectively closed by sides **15** and the bottom closed by platform **19,** frame **18** and mattress **17.** One important aspect of this invention is the ability to raise or lower the bed as an integral unit relative to base **11.** This is accomplished by raising frame **14** unitarily with mattress **17,** frame **18** and platform **19** regardless of their Trendelenburg or Gatch positioning.

Referring now to FIG. **5,** one form of a lift means **40** for electrically raising and lowering the bed is shown. The lift means to be described herein is provided in both end posts **13** to simultaneously raise both end frames **26** in unison. Since the lift means is identical in both ends, only one will be described in detail. In order to provide lift or descent for support frame **14,** an electric motor **41** is mounted to channel frame **21** at approximately its mid point longitudinally with respect to the bed. This is a matter of convenience since motor **41** is utilized to activate both lift means **40** at each end. At the same time, its mid-location tends to shield it from the eye of an observer in those instances where the bed is in a lowered position thereby improving the overall appearance of the bed. Motor **41** includes a drive shaft **42** (FIG. **5**) which rotates a worm gear **43** having teeth engaged with a reciprocating worm gear **44** which is driven rotationally about a horizontal longitudinal axis. Worm gear **44** is attached to one end of a rod **45** journaled in a pair of bushings **46** and driven for joint rotation with worm gear **44** by motor **41.** Bushings **46** are preferably supports in the form of ductile steel castings. The opposite end **48** of rod **45** includes a right angle bevel gear **49** in mesh engagement with a reciprocating bevel gear **50** anchored on a threaded rod **51** extending upwardly through end posts **13** and end frame posts **29.** Rod **51** is journaled at its lower end in a bushing **47** comprised of a ductile steel casting similar to bushings **46.** Rod **51** is threadably engaged with a ball screw **54** which is connected to post **29** by a pair of pins **56** to provide vertical movement of frame **14** and hence the bed. Ball screw **54** is positioned above the upper end **57** of post **13** which end acts as a lower stop for the bed elevation. In the embodiment shown in FIG. **5,** end frame post **29** is approximately twice the height of post **13.** Thus, the amount of vertical travel is approximately equal to half of the length of post **29.** Preferably the amount of travel is approximately sufficient to raise and lower the overall elevation of the bed surface frame 12–16 inches to 38–42 inches depending on the particular age and size of the patient.

Briefly, rotation of rod **45** through the utilization of right angle bevel gears **49** and **50** causes threaded rod **51** to rotate in the same direction as rod **45** about a vertical axis. The upper end of rod **51** is journaled in a thrust bearing **53,** thrust bearing **53** being anchored

within end frame post **29** in the vicinity of its upper end. Ball screw **54** is threadably engaged with rod **51** but prevented from rotating relative thereto in a known fashion. Rotation of rod **51** results in axial displacement of ball screw **54** and likewise displacement of post **29**. Accordingly, the entire support frame **14** is lifted or lowered evenly at both ends depending on the rotational direction of rods **45** and **51** which is dependent on the directional rotation of motor **41**. Thus a simple, dependable and effective lifting means is provided which requires no physical exertion other than the movement of an appropriate switch into the up or down position. A slightly modified form is shown in FIG. **2** which eliminates the utilization of pins **56**. In this embodiment the same overall principle is involved utilizing ball screw **54***a*. However an interal tube **55** is threaded to the upper end of ball screw **54***a* anchored at its upper end to post **29** by a pin **290** receivable in post **29** by an opening **292**. A bearing **294** journals tube **55**, bearing **294** also being anchored to post **29** by pins **296**. Similar to the embodiment shown in FIG. **5**, rotation of ball screw **54***a* transmits vertical movement of end frame **26** through tube **55**.

One important objective of this invention as noted earlier is to provide a pediatric bed which is adaptable as a crib, playpen or youth bed. When utilized as a crib, it is desirable to have the bed surface elevated for the sake of the nurse taking care of the infant since the higher the elevation, the less bending required. On the other hand, if the bed is to be utilized as a playpen, it is most desirable that the bed surface be as low to the ground as practical. Finally, when utilized as a youth bed, the elevation of the bed surface ideally lies intermediate that of a playpen and crib. According to this invention, lift means **40** permits raising and lowering the bed surface between a minimum elevation from the floor of 12–16 inches and a maximum height of 38–42 inches. After extensive testing, this range of elevation has been found to provide optimum flexibility although wide flexibility is available. The lower elevation permits a child to sit on the mattress with his legs on the floor. The upper limit is desirable for a nurse to service a child without excessive bending etc. The low profile of base **11** is one unique aspect which permits the lowering of bed **10** to a surface elevation of **16** inches.

When bed **10** is utilized as a playpen or crib, sides **15** are preferably in a fully up position. Referring briefly to FIGS. **1** and **24–31**, bed **10** includes a pair of identical sides **15** slidably mounted to support frame **14** for independent movement between a fully lowered and fully raised position. The left side in FIG. **1** illustrates the fully raised position while the right side illustrates the fully lowered position. In the preferred embodiment, the sides are also adaptable for positioning in a partially raised position essentially mid-way between the fully lowered and fully raised positions. FIG. **31** illustrates both of the sides positioned at the intermediate position.

With the sides fully raised, the bed is particularly adaptable for use as a crib or playpen. When utilized as a crib, the bed surface is generally raised to its maximum level of elevation as shown in FIG. **25**. When utilized as a playpen, the bed is generally lowered to its maximum level of elevation as shown in FIG. **24**. The bed is also adaptable for occupancy by a some-what older child whrein the encapsulating features required for an infant do not exist. When utilized thusly, it might be preferred to have both sides in their fully lowered positions as shown in FIG. **29**. On the other hand, due to the disability or illness of the occupant, there might be some consideration to prevent accidental falling from the bed wherein the sides are positioned in their intermediate positions such as shown in FIG. **31**. In any event, no matter what the age or demeanor of the occupant, it is desirable that either side be quickly and easily lowered to permit easy access to the bed.

Since the two sides are identical to each other, only one will be described in particular detail. The particular arrangement of sides **15** is illustrated in more detail in FIGS. **2** and **6–8**. Preferably, sides **15** are mounted on a Tambour track **60** (FIG. **2**) with the sides being flexible to be folded through a right angle **61** so that when the side is in its lowermost position, it is completely tucked under the bed as illustrated in FIG. **1**. In the prior art, the sides generally move vertically in a plane and hence are fully exposed when in their lowermost position. By concealing the sides beneath the bed platform, they are less apt to be damaged, and are more inaccessible to the occupant so that there is less tendency that the occupant will manipulate the sides by himself. In addition, the concealed position is believed to be more appealing in terms of the overall appearance of the bed.

With reference to FIG. **2**, a pair of Tambour tracks **58** and **60** are mounted on each end frame **26** and are shaped in conformity with peripheral frame elements **30** and **31**. Similar to end frame elements **30** and **31**, each Tambour track **58** and **60** includes a lower horizontal portion **62** (FIG. **2**) which is smoothly curved into an outer and lower vertical portion **63** which is subsequently smoothly curved inwardly into a sloped portion **64**. These portions essentially coincide with portions **32**, **33***a* and **33***b* described in detail with respect to the shape of peripheral frame elements **30** and **31**. However, lower horizontal portions **62** extend the entire width of the bed in order to permit sides **15** to be concealed beneath platform **19** when fully lowered.

Preferably, tracks **58** and **60** are comprised of chrome-plated steel or stainless steel having sufficient rigidity so that they need be anchored only at their end points. Referring to FIGS. **2** and **3**, vertical portion **63** of track **58** is preferably a little longer than vertical portion **63** of track **60** so that when tracks **58** and **60** are mounted on each end **26**, horizontal portion **62** of track **58** is spaced beneath horizontal portion **62** of track **60** so that when both sides are lowered into their lower position, the two sides are stacked relative to each other. To mount tracks **58** and **60** to end frame **26**, the lower end of track **58** is mounted to frame element **30** while its upper end is mounted to frame element **31**. Conversely, track **60** has its lower end mounted to frame **31** with its upper end mounted to frame **30**. With reference to FIG. **3**, the lower ends of tracks **58** and **60** are curved slightly upwards to accommodate the full width of sides **15** when lowered into their lowermost position. This may or may not be necessary depending on the overall width of the bed. However in the preferred embodiment, the optimum width of the bed is **32** to **34** inches which is slightly less than the overall height of sides **15**. Therefore, to accommodate sides **15** in their concealed positions, the upper and lower edges of sides **15** are slightly exposed. Indeed, in order to provide easy manipulation of the latch assembly **74** to be described in more detail hereinafter, the upper edge of

sides 15 are exposed to make the latch mechanism accessible.

A plug-type connector 65 is shown in FIGS. 1–3 for anchoring the tracks to the particular frame element. Connector 65 is cylindrical and includes an annular recess 66 for receipt of the particular end of the track being anchored. It includes a nose portion 67 which inserts into an opening provided in frame elements 30 and 31 to anchor the track to the frame. Nose portion 67 may be threaded into frame elements 30 and 31 with annular openings 66 aligned for the respect of ends of the tracks. As illustrated in the drawings, the upper end of tracks 58 and 60 are anchored just below the termination point between upper horizontal portion 34 and slope portion 33*b* of frame elements 30 and 31.

Side 15 itself is preferably comprised of a polyethylene netting 68 which is mesh-like and yieldable. A material such as Vexar is ideal since it is sufficiently stiff to prevent sagging while at the same time flexible enough to move along the shapes of tracks 58 and 60. Another consideration of importance is the occasional abrupt movements by a child causing some portion of the child's body to strike the sides. A polyethylene netting such as Vexar will yield under such contact to minimize the chance of injury occuring. Also, the netting provides excellent anti-climb characteristics because the openings of the netting are too small to penetrate with a child's finger so that he can't get a good grip to climb with. In fact, the Vexar netting has a slick greasy-like feel which also makes it difficult to grip. On the other hand it provides good visual penetraction in keeping with the total omni vision aspect into and out of the bed.

The sides of the netting are sewn to a flexible piece of extruded piping 69 (FIG. 2) which includes a plurality of Tambour rings 70 attached thereto which slip over tracks 58 and 60 to guide and hold side 15 within the confines of the tracks. As noted earlier in the BACKGROUND, the sides of hospital cribs and beds are often difficult to lower and tend to jam. The utilization of a Tambour track arrangement provides a very smooth and easy movement for the sides greatly reducing any tendency to jam. By properly selecting the spacing of the rings, the movement and folding of the sides as it is traversed along the track is very similar to a plurality of living hinges so that there is little resistance to folding movement of the sides. The lower margin of sides 15 are likewise secured or sewn to a piece of extruded piping 71 similar in configuration to that utilized for the sides. It has been found that an extruded plastic works extremely well in that its material properties provide sufficient strength and flexibility to conform to the movement of sides 15 along tracks 58 and 60.

The upper margin of side 15 is anchored to a cover tube 72 which includes a latch assembly 74 for releasing side 15 when in their fully raised or intermediate positions. Cover tube 72 is preferably a cylindrical tube and includes a radial portion 73 having a generally U-shaped configuration for fitting over the upper margin of netting 68 for anchoring the same thereto by sewing or other conventional means. Each end of cover tube 72 includes a pair of aligned circular openings 75 (FIG. 6) spaced slightly inwardly from each end in general alignment with Tambour rings 70. The Tambour track 60 is mounted through openings 75 thus securely anchoring the upper margin of the sides to the track. At the mid portions of cover tube 72 are a pair of generally L-shaped slots 76 and 77. The main portion of slots 76 and 77 extend longitudinally with respect to tube 72 while their leg portions 78 extend laterally in the same direction from the inner ends respectively of slots 76 and 77. Slots 76 and 77 permit the manipulation of latch mechanism 74 as will be described in more detail hereinafter.

A pair of latch tubes, left hand tube 79 and right hand tube 80 are telescoped within cover tube 72 and through their combined lengths extend longitudinally between the Tambour tracks mounted on each end of the bed. Tubes 79 and 80 are adapted to be biased outwardly so that their outer ends are urged against tracks 60 in accordance with the operation of the latch mechanism which will now be described. Left hand tube 79 extends beyond the mid portion of the bed and includes at its inner end a reduced portion 81 having an elongated slot 82 open at its inner end. Spaced outwardly from reduced portion 81 is a tap 83 for receipt of a latching pin 84 shown in FIG. 2. Right hand tube 80 is similar in cross section to tube 79 except that it does not include a portion corresponding to reduced portion 81 of tube 79. Rather, tube 80 is adapted at its inner end to receive portion 81 for telescoping movement within its inner end. Spaced inwardly from its inner end is a tap 85 (FIG. 8) adapted to receive latching pin 86 (FIG. 2). In addition to tap 85, right hand tube 80 includes a radial opening 87 spaced inwardly from its inner end a distance approximately equal to the longitudinal extension of reduced portion 81. Opening 87 is adapted to receive a threaded pin 88 (FIG. 6) which extends through the diameter of tube 80. A coil spring 89 is inserted concentrically within the inner end of tube 80 against pin 88 for abutment at its opposite end by the inner end of tube 79. In this fashion, when tube 79 is positioned within cover tube 72 along with tube 80 so that portion 81 is telescoped within the inner end of tube 80, spring 89 is compressed between pin 88 and the inner end of tube 79 so that tubes 79 and 80 are biased outwardly. With the tubes inserted so that taps 83 and 85 are exposed beneath slots 76 and 77, latch pins 84 and 86 are threaded respectively into taps 83 and 85 to secure the tubes within cover tube 72. A slightly modified form to that shown in FIGS. 6–8 is shown in FIG. 2 wherein the reduced portion 81 is replaced with a rod 81a which fits within the bore of tube 79 and is anchored thereto by a pin 91. Rod 81 telescopes into tube 80 which includes spring 89 and secured in the bore of tube 80 in the same fashion as described with respect to FIGS. 6–8.

The outer ends of tubes 79 and 80 include a generally U-shaped radially extending keeper slot 90 (shown only on tube 80 in FIG. 8) which has a cross sectional diameter less than that of tracks 58 and 60 so that except in specific instances, the outer ends of tubes 79 and 80 abut against tracks with pins 84 and 86 positioned in their innermost position in slots 76 and 77 opposite to that shown in FIG. 6. However, at two selected points, tracks 58 and 60 include a reduced cross-sectional portion or notch 92 (one of which is shown on track 60 FIGS. 6 and 6A). Slot 90 is designed to fit into notches 92 to lock sides 15 to the tracks at that particular position. Notches 92 are positioned on each track 58 and 60 at the extreme upper end of the tracks and at the intermediate positions between the vertical portion 63 and sloped portion 64 of track 60. Thus, ex-

cept for these two positions, latch mechanism **74** will always be in what is referred to as a travel position. I.e., the side is free for travel up or down along the tracks. However, when tubes **79** and **80** are moved into alignment with a set of notches, spring **89** urges the tubes outwardly so slots **90** engage notches **92** thus stopping and locking the side at that position.

To prevent locking engagement by keeper slots **90**, pins **84** and **86** must be manipulated inwardly to prevent engagement. Thus, to move a side from the lowermost position to the uppermost position, the nurse simply squeezes pins **84** and **86** inwardly and lifts the side up past the intermediate notches until the sides reach the upper limit of the Tambour tracks whereupon the pins are released so that tubes **79** and **80** snap into engagement with notches **92** at the upper end of the tracks. Consequently, to release a side from its up or intermediate position, pins **84** and **86** are simply squeezed together and the side is lowered. If the side is in its lowermost position and it is desired to raise it to the intermediate position, the nurse simply lifts the side up without manipulating pins **84** and **86** until they snap into the intermediate notches **92.** If on the other hand the side is in its uppermost position and it is desired to lower it to the intermediate position, the nurse initially manipulates pins **84** and **86** to release mechanism **74** whereupon without further manipulation, the side is simply lowered until tubes **79** and **80** snap into place in intermediate notches **92.**

In a particular aspect of this invention, it is desired to provide easy adjusting sides which require but one hand to manipulate. Many times a nurse has one arm occupied in holding equipment or an infant and it is desired to manipulate a side without putting the child or equipment down. This invention provides means for automatically locking latch mechanism **74** in a release or travel position so that the side can be independently gripped and moved without grasping pins **84** and **86.** To accomplish this, reference is made to slots **90** which have an overall U-shaped configuration. It will be appreciated that if tubes **79** and **80** are rotated so that it is impossible to align slots **90** with tracks **58** and **60,** regardless of the elevation of the side, it cannot engage either of the intermediate or upper position notches. To accomplish this, the nurse with one hand simply squeezes pins **84** aand **86** together and when they reach their innermost positions rotates them upwardly into the leg portions of slots **82.** Once rotated into this position, the bias of spring **89** maintains the pins in the leg portion of the slots and the sides are now free to travel entirely from the lowermost position to the uppermost position without snapping into the intermediate notches. Likewise, it can travel from the uppermost position to the lowermost position without snapping into the intermediate notches. A slight modification is shown in FIG. **2** wherein the width of slots **76***a* and **77***a* sufficiently exceed the diameter of pins **84** and **86** permitting sufficient rotation of tubes **79** and **80** to lock them in their travel position.

In the embodiment shown, the overall length of tubes **79** and **80** are selected so that when the latch mechanism is in its travel position, there is sufficient engagement between the outer ends of tubes **79** and **80** with tracks **58** and **60** so that the sides are frictionally held in any particular position. That is, when the sides are released or let go of by the user, they will not automatically fall by their gravitational weight. Instead, they require positive motivation to raise or lower the sides. This is particularly useful when the lock means is utilized since it permits the nurse or orderly to manipulate pins **84** and **86** into the lock open position whereupon the same hand can be removed from the side for more firmly gripping it to raise or lower it without worrying about it dropping suddenly down.

An important safety feature provided by this invention is the inaccessiblity to the occupant to latching pins **84** and **86** for manipulation of the latch. Cover tube **72** and latch tubes **79** and **80** are arranged so that pins **84** and **86** extend vertically downwards on the outside of netting **68.** By simply locating the latch mechanism on the outside of the sides, they are difficult to get at by the child. To begin with, the Vexar netting prevents penetration by the child's fingers for manipulation from within the crib. Therefore, it is necessary that the child reach up over the top of the side and then downwards to handle the latches. The vertical downward orientation simply makes it more difficult should the child be able to reach over the top of the side. When latch mechanism **74** is locked into the travel position, pins **84** and **86** extend horizontally outwards which places them in slightly closer proximity to the child, however, this position is envisioned as being used only when an attendant is near.

Previously, it has been emphasized that one preferred aspect of sides **15** is its anti-climb characteristic which discourages younger infants from climbing out of the bed when it is utilized as a playpen or crib. The utilization of a polyethylene netting such as Vexar contributes to this in that it cannot be penetrated by an infant's fingers and it is also slippery to the touch thereby making it difficult to get a firm grip on the netting. An additional and important anti-climb characteristic is provided by the inwardly sloped upper portion **64** of tracks **58** and **60** which guides sides **15** into a likewise inwardly sloped configuration when the sides are locked in their uppermost position. This inwardly sloped portion greatly reduces the opportunity for a young infant to climb out of the crib thereby reducing the possiblity for injury resulting from a fall. Should the child be capable of gripping some portion to lift himself up onto the side, its inward slope makes it much more difficult to traverse.

Having described the Tambour sides in detail, it should be obvious how to raise and lower a particular side independently of the other into a fully lowered, intermediate or fully raised position. As illustrated in FIGS. **1** and **29,** when the sides are lowered into their fully lowered position, they are essentially concealed and positioned under the bed platform **19** and hence protected from undue wear and tear which is always present when children are around. Referring now back to FIG. **1,** mattress **17** is shown mounted on platform **19** which is secured to support frame **14.** The mattress and platform are shown in one of several Trendelenburg positions. Briefly, Trendelenburg positioning refers to the angle at which the patient lies with respect to the horizontal. This ranges from **0** degrees to a plus or minus angle. I.e., the head can be raised with respect to the feet or lowered with respect thereto. Since the concept of Trendelenburg positioning is well known, only the details of the structure permitting this positioning will be described herein.

Mattress support platform **19** is preferably comprised of a generally rectangular frame member having a pair

of sides 95 and ends 96 interconnected or formed as a unitary member. To conserve material and reduce the overall weight as much as possible, sides 95 and ends 96 preferably comprise aluminum channel elements which provide sufficient rigidity and strength for support of the occupant. In addition to platform 19, an additional mattress frame 18 is connected to platform 19 and adjustable for Gatch positioning. The mattress is secured to frame 18 which in turn is connected to platform 19. Each side 95 of platform 19 includes one or more longitudinally spaced and aligned openings 97 for mounting frame 18 thereto.

In keeping with the principal objectives of this invention, the utility of this bed is enhanced by providing means for Trendelenburg positioning. On the other hand, since cost is not an insignificant factor, the preferred embodiment utilizes manual adjustment although mechanized adjustment could be provided. Referring to FIG. 10, an arm 97 is secured to each end of sides 95. The arms extend from the lower surface to permit mattress 17 to fit over platform 19 as will be described hereinafter. Each arm extends outwardly at an angle from sides 95 and then longitudinally outward parallel thereto. A generally U-shaped handle bar 98 is connected at each end to a pair of arms 97 to form a lift handle similar in part to a stretcher. Handles 98 include a mid portion 99 extending parallel to ends 96 of the platform and exceed the width of the platform. Each end of handle 98 is turned inwardly at right angles to mid portion 99 for connection to the longitudinal extending end portions of arms 97. They are connected to arms 97 by a connector 100 which also acts as a guide to permit quick and easy Trendelenburg positioning adjustment.

Connector 100 (FIG. 4) has a tubular configuration and includes an outer and inner end portion 101 and 102 separated by a mid portion 103. The support of platform 19, mattress frame 18 and mattress 17 is provided by Trendelenburg association between connectors 100 and trendelenburg plates 20. Since arms 97 extend essentially from each corner of platform 19, four plates 20 are provied, one for association with each arm and connector. In describing the cooperation of connectors 100 with Trendelenburg plates 20, only one will be critically examined, the remainder of which are identical.

Each end frame 26 includes a Trendelenburg plate 20 affixed to each lower inner corner. Plate 20 is relatively flat to lie in the plane of ends 26. They are vertically elongated and shaped at lower end 106 to nestle within the contour of the termination between lower horizontal portion 32 and lower vertical portion 33a of each frame elements 30 and 31. In the preferred embodiment, plate 20 is welded to the appropriate interior portions of frame elements 30 and 31 and are comprised of aluminum or chrome-plated steel. Each plate includes a vertical elongated slot 107 with an enlarged opening 108 and 109 at each end and an intermediate enlarged opening 110 in between the end openings. Opening 109 has a diameter in excess of the largest cross sectional dimension of connector 100 to permit endwise movement of connector 100 into and through opening 109. In this fashion, platform 19 can be attached to end frames 26 through plates 20 by inserting connectors 100 through openings 109; affixing portion 102 to the outer end of arms 97 of platform 19; and then affixing handle bar 98 to the opposite portion 101 of connector 100 to securely confine platform 19 within the movement of slots 107 of plates 20. Thus, regardless of the platform position in the slot, it along with frame 18 and mattress 17 are positively suspended from frame 14.

Referring to FIG. 4, each end of handle 98 is securely affixed to end 101 of connector 100 in a conventional fashion. The outer end of arms 97 however are secured to connector 100 for sliding engagement relative thereto. In the preferred embodiment, arm 97 telescopes within connector 100 and is a solid bar. An elongated recess 111 is provided in arm 97 but does not extend to its outer end. A set screw 112 is threadable radially through end portion 102 of connector 100 for extension into slot 111 so that connector 100 and attached handle 98 are slidable endwise relative to arms 97 the length of recess 111. The significance of this will be clarified shortly.

Turning now to the cross-sectional configuration of each connector 100 (FIG. 4), each end portion 101 and 102 increases in cross section inwardly from their respective outer ends to a maximum at the juncture with mid portion 103. Mid portion 103 has a cross section which varies as follows. At the juncture with end portion 102, the cross sectional diameter of mid portion 103 decreases rapidly to a minimum at 113 and then slopes upwardly once more toward a maximum at the juncture with end portion 101 at 114. Thus, the overall cross sectional diameter along any point of mid portion 103 is substantially less than the maximums of end portions 101 and 102. The configuration of mid portion 103 is selected such that at its minimum cross sectional point 113, it will slide freely up or down elongated slot 107 of plate 20. However, when it is positioned within one of the openings 108, 109 or 110, endwise movement of handle 98 and connectors 100 inwardly permits movement of the connectors so that the enlarged cross section configuration of mid portion 103 at 114 is aligned with slot 107 and hence prevented from vertical movement relative thereto since it is substantially greater dimensionally. In this fashion, the height of each end of platform 19 is adjusted. With the platform arranged for example as shown in FIG. 1, the nurse or orderly simply pulls outwardly on handle 98 so that connectors 100 and handle 98 move relative to arms 97 until the point 113 is aligned with slot 107. At this time, the end of platform 19 can be raised to either of two positions. The first position is when connector 100 is aligned within opening 110 and the second is when connector 100 is aligned with opening 109. After selecting the desired position, the nurse or orderly simply pushes inwardly on handle 98 until portion 114 of mid portion 103 is positioned within the desired opening. This locks the connector in the slot since this enlarged cross sectional dimension cannot traverse slot 107. Thus, the connectors on each end of platform 19 are selectively captured within one of openings 108, 109 or 110 to position that end of platform 19 at the desired level. In this fashion, the Trendelenburg positioning of the platform is selected from the head up to the head down or level position. It will also be appreciated that the cooperation of plates 20 and connectors 100 do provide some height adjustment for the platform independent of lift mechanism 40 described hereinbefore. Although only three openings are shown in plates 20, more could be utilized although three have

proven to provide adequate Trendenenburg positioning.

An alternative configuration for mid portion **103** of connector **100** is a non-linear portion (not shown) which cams portions **114** into one of the selected openings thus necessitating affirmative movement of each connector from the slot to alter its position.

Referring now to FIGS. **10–13** mattress frame **18** will be described in detail. The primary function of frame **18** is to provide for Gatch position adjustment. Gatch positioning is well known in the art and refers to the knees-up, back-up arrangements for a patient reclining in a bed. Again, within the objectives of this invention, manual Gatch positioning is provided in order to keep the overall costs within an acceptable range. However, it will be appreciated that mechanized Gatch positioning could be utilized.

Frame **18** is essentially comprised of a pair of subframe assemblies **116** and **117** each of which is pivotally connected to platform **19.** Sub-frame **116** (FIG. **10**) provides the adjustable back support for the patient and is adjustable from the horizontal position to a plurality of incline positions for raising the patients back and head. Sub-frame **117** supports the patient's legs between a horizontal and inclined knees-up position.

Frame **116** includes a pair of generally U-shaped telescoping frames **118** and **119** with the legs **120** of frame **118** forming a telescoping fit within the legs **121** of frame **119.** Legs **121** are preferably tubular box-shaped channel members so that when legs **120** are inserted therein, frame **118** is prevented from rotating relative to frame **119.** Legs **120** include a pair of aligned slots **122** through their sides and are concealed within legs **121** when telescoped therein. Legs **121** include a pair of aligned openings **123** through their sides for insertion of adjusting pins **124** which when inserted through openings **123** and slots **122** prevent endwise removal of upper frame **118** from lower frame **119.** According to the length of slots **122,** the overall length of sub-frame **116** can be adjusted. With frame **118** inserted in frame **119,** a rectangular configuration is provided.

The web portion **125,** of frame **119** is preferably a hollow tubular element having an overall length sufficient to fit snugly between the inner walls of sides **95** of platform **19.** It is aligned with one of the pairs of openings **99** provided through sides **95** for insertion of a fastening element **126** on each side which fits through opening **99** into each end of web portion **125** for threaded engagement therewith which when tightened locks sub-frame **116** in its desired angular position relative to platform **19.** Thus, to raise back support frame **116** relative to platform **19,** the nurse or orderly simply loosens elements **126** on each side of the subframe and raises the frame to its desired angle of elevation whereupon elements **126** are tightened to secure the subframe in its desired position. A handle **127** is preferably attached near the outer end of each leg **120** of frame **118** to facilitate the lifting and lowering of sub-frame **116** into its desired position. The back support frame **116** is thus rotatable independently of the knee support adjustment frame **117.** Preferably fasteners **126** always maintain sufficient frictional engagement with web **125** to prevent abrupt downward movement of back support **116** when it is lowered.

Referring now to the knee support sub-frame **117,** it is also comprised of a pair of frames **130** and **131** which are interconnected. Frame **131** is similar to frame **121** described with respect to the back support frame in that it is generally U-shaped including a web portion **132** and two legs **133.** Frame **130** is comprised of a generally H-shaped frame (FIG. **11**) having a pair of lower leg portions **134** and upper leg portions **138.** Legs **134** are adapted dimensionally to fit snugly outside legs **133** of frame **131.** They include a longitudinally extending recess or keeper slot **136** (FIGS. **10** and **12**) adapted for receipt of a longitudinally extending keeper **137** extending laterally from the outer sides of legs **133** so that when these legs are flexed inwardly to permit keepers **137** to project into slots **136,** frames **130** and **131** are interconnected so that they will not rotate relative to each other. At the same time, keepers **137** are permitted to slide endwise within slots **136** so that longitudinal adjustment of subframe **117** is provided. The upper legs **138** of frame **130** slopes downwardly at an angle with respect to lower legs **134** to provide for knee bending when frame **117** is raised into a Gatch position. Since frame **18** is sized to fit with sides **95** and ends **96** of frame **19,** legs **138** project downwardly from mattress **17** when lowered to permit a horizontal bed surface. The upper and lower leg of frame **130** are rigidly interconnected by cross support **135.** According to the preferred embodiment, the knees of the patient should be located approximately above cross bar **135** which is where legs **138** slope downwardly. Since children vary greatly in size and growth rates, lengthwise adjustment of the positions of cross bar **135** is essential. In fact, the length-wise growth rate of the thighs tends to exceed that of other bone structures in children. Thus, some adjustment is necessary in order that this type of bed accommodate various sized children. The cooperation of keepers **137** and slots **136** provide a sufficient range of adjustment in the overall length of knee adjustment support frame **117.** Thus, it is possible in accordance with this invention to locate the juncture point between upper and lower legs **134** and **138** beneath the patients knees simply by extending or retracting the upper frame **130** relative to frame **131.**

The Gatch position is achieved by pivotally mounting sub-frame **117** relative to platform **19** in a fashion similar to back support adjustment sub-frame **118.** The web portion **132** of frame **131** is preferably tubular and extends dimensionally to fit snugly within sides **95** of platform **19.** When aligned with one of the pairs of openings **99** provided in sides **95** of frame **19,** appropriate fasteners (not shown) are inserted through openings **99** to pivotally secure sub-frame **117** to platform **19.**

A support brace **140** is swingably mounted to frame **117** to lock sub-frame **117** into the Gatch (knee-up) position. Brace **140** includes a horizontal portion **141** and a pair of upwardly extending finger-like projections **142** bent outwardly at their upper ends to form a horizontal pin portion **143.** Pins **143** are adapted to fit within an opening **144** provided at the outer end of leg **133** of frame element **131,** pins **143** being of sufficient length to fit through openings **144** and extend into slots **136** of frame element **130.** Once installed, brace **140** is swingable from the vertical configuration shown in FIGS. **10-13** to a horizontal configuration. In the horizontal position, brace **140** is sandwiched between platform **19** and frame **130.** In its vertical orientation as shown in the drawings the leg support frame **117** is raised into the Gatch position. A keeper plate **145** having an indent **286** is mounted on each inner face of

sides 95 of platform 19 to anchor sub-frame 117 into the Gatch position. Plate 145 includes a vertical portion 287 having a sloped upper edge which dams the ends of horizontal brace portion 141 into and out of indent 286 when sub-frame 117 is lifted into or out of the Gatch position.

As a result of the foregoing, the manipulation of Gatch frame 18 should be obvious. In order to raise back support frame 118 into a desired angular position with relation to platform 19, fasteners 126 are loosened to permit free rotation of frame 18 by gripping handle 127. When the desired position is reached, elements 126 are tightened to secure the back rest in the desired position. In order to raise the knee support frame 117 into the Gatch position, frame 117 is lifted up to permit brace 142 to swing downwardly into a vertical position until brace 141 is captured in recess 286 of keeper 145. It will be appreciated that appropriate dampers can be utilized in connection with the rotation of knee support frame 117 so that the movement is not abrupt. In order to adjust the overall length of knee support frame 117, upper portion 130 can be moved endwise relative to lower portion 131 by the inter-engagement of keepers 137 in slots 136.

Referring now to FIGS. 1 and 9, the latter figure illustrates mattress 17 in perspective at a significantly reduced scale. FIG. 1 shows the mattress installed on the finished product with a sheet 141 completely covering the mattress. Mattress 17 is designed to completely shield frame 18 except for the protrusion of handles 127. Ideally, mattress 17 should be thin relative to its length and width to facilitate bending without significantly wrinkling sheet 141 as frame 18 is manipulated into one or more Gatch positions. In the preferred embodiment, the mattress is molded from ABS plastic and includes a foam overlay of urethane. This provides a mattress material which is not only durable, but extremely light to handle and extremely flexible to permit folding movement into various Gatch positions. In addition, it is not condusive to soiling and in any event is easy to clean. The particular details of mattress 17 are shown clearly in FIGS. 14–23.

The basic cross sectional configuration of mattress 17 is shown in FIG. 15. The underside 142 is a molded or extruded plastic having depending rib and channel portions to provide sufficient strength and utility, the details of which will be described hereinafter. The entire upper margin 143 of underside 142 is continuous and smooth so that an upper layer 144 of polyurethane foam can be attached thereto. This upper layer of foam provides the essential body support for the mattress while the underside 143 is functional to receive frames 18 and 19 as well as provide the requisite bending and strength for the mattress.

Referring to FIG. 14, underside 142 includes three central longitudinally spaced portions 145, 146 and 147 which provide the central strength and support respectively for the legs, thighs and back of the patient. A spacing 157 is provided intermediate portions 145 and 146, (FIGS. 14 and 15) in which are disposed two laterally extending box-like ribs 148 and 149 spaced equally from each other and the adjacent central portions 145 and 146. This provides three identical channel-ways 150, 151 and 152 extending laterally across the width of mattress 17. Each channel-way includes a pair of side walls 153 and a ceiling 154 dimensional to receive cross support 135 (FIG. 11) of Gatch frame 18 which is the point of bend for the knees of the patient. As noted earlier, the overall length of the knee support subframe 117 is adjustable to accommodate children or infants having thighs of varying lengths. The provisions of channel-ways 150, 151 and 152 permits three selected adjustments which has proven adequate within the range of patients for which the bed is designed. The width and depth of the channel-ways is selected to provide a snug friction fit over cross bar 135. The ceiling 154 of each channel-way includes a pair of indents 155 extending laterally across the ceiling to form what is known as a living hinge. This living hinge permits continuous bending of the mattress at this point while reducing any tendency to tear or fatigue.

Intermediate central support portions 146 and 147, there is a spacing 156 substantially wider than channel-ways 150, 151 or 152. This spacing defines the juncture and bending point between the back rest sub-frame 116 and the knee support sub-frame 117 (FIG. 10). In addition, the angular rotation of the back rest support is substantially greater than the knee support. As shown in FIG. 15, the normal range of bending the back rest support is between 0° and 90°. In order to facilitate bending, a pair of laterally extending indents 155*a* are provided laterally along spacing 156 identical to the indents located at spacing 57 to form a living hinge. Spacing 156 is also utilized to accommodate web portions 125 and 132 which form the pivotal axis for sub-frame assemblies 116 and 117.

A plurality of inverted cup-shaped openings 180 are randomly provided in each of the central portions 145, 146 and 147 in order to economize the amount of material required without reducing its overall strength and support. These spaced recesses 180 also tend to provide a more comfortable mattress since it yields proportionately better than a solid mass. Referring to FIG. 15, ribs 148 and 149 are also preferably hollow and tubular in configuration to reduce the overall amount of material required as well as enhance its function as a mattress.

Referring now to FIGS. 14 and 16, a pair of generally continuous grooves 158 and 162 are spaced inwardly with respect to each other and from the outer periphery of mattress 17. The outer groove 158 is formed by a pair of downwardly depending flanges 159 and 160 (FIG. 23) forming a pair of side walls 161. Groove 158 is continuous except for its interruption at the spacings 156 and 157 between central portions 145, 146 and 146, 147 which spacings extend laterally the entire width of mattress 17. Consequently, groove 158 is comprised of two generally U-shaped end portions and an intermediate straight portion on each side extending the length of central portion 146. Where this type of mattress is utilized with a rigid frame, the groove could be continuous.

Disposed within each portion of groove 158 is a sheet retaining extrusion 164. Extrusion 164 is preferably tubular and has a box cross section so that it can be snugly disposed within groove 158 intermediate side walls 161. The lower ends 165 of extrusion 164 are formed inwardly and upwardly into contact with each other at their innermost ends 166 to form a pair of gripping fingers 167 resiliently biased into contact with each other to grip the peripheral edging 168 of sheet 141. This provides a very simple and convenient sheet gripping element extending substantially continuously around the periphery of mattress 17. The nurse or or-

derly simply places the sheet over the top side of mattress 17 and wedges the peripheral edges 168 of the sheet in between fingers 167. Preferably, fingers 167 are flexible enough to permit a person's fingers to be wedged therebetween while at the same time they are of sufficient resiliency to return to their normal abutting position to grip the sheet therebetween after one's fingers are removed. In this fashion, the sheet can be quickly removed from extrusion 164.

Extrusion 164 provides two significant advantages. It eliminates the somewhat clumsy and ineffective traditional way of anchoring a sheet to a mattress which is to simply fold the overflap beneath the mattress. This type of tucking can quickly become ruffled. In addition, it permits the utilization of a sheet of smaller size in relation to a given mattress size since the edging need extend over the mattress only a distance to anchor it within fingers 167. Therefore, sheet gripping extension 164 provides economical savings in relation to the size of sheet required in addition to making the overall job of changing sheets much simpler. Although other materials are envisioned, in the preferred embodiment, extrusion 164 is comprised of an extruded plastic tubing.

Groove 162 is spaced inwardly from groove 158 by flange 160, the inner portion 169 of which forms the outer boundary of groove 162. The triangular configuration of flanges 159 and 160 shown in FIG. 23 are to provide sufficient strength in side walls 161 to provide a quasi-wedge engagement between the side walls and extrusion 164. The utilization of groove 162 does not necessitate a wedge engagement and therefore a vertical side wall is not required. The innermost side of groove 162 is formed by the outer walls of central portions 145, 146 and 147. Groove 162 similar to groove 158 is interrupted at the spacings between the central portions and hence is essentially comprised of two generally U-shaped end portions and a pair of intermediate straight portions extending essentially the length of central portion 146. Groove 162 is substantially wider than groove 158 and is designed to accommodate the placement of mattress 17 over platform 19 and frame 18. The depth of groove 162 is essentially equal to the height of sides 95 and ends 96 of platform 18 which are disposed in groove 162 along its outer portion. It is less than the depth of gr0ove 158, the significance of which will be clarified shortly. Since sub-frames 116 and 117 of frame 18 fit within the confines of platform sides 95, they are disposed in the innermost portion of groove 162. In this fashion, central portion 147 is disposed within the sides and web portions of frames 118 and 119 (FIG. 10); central portion 146 is disposed intermediate the sides and web portions of frames 130 and 131 while central portion 145 is disposed within upper legs 158 and cross support 135 of frame 130. It will be appreciated that as frame 18 is manipulated to raise the knees and back, portions of mattress 17 are lifted off and away from support platform 19. However, when frame 18 is in the overall horizontal position, mattress 17 encloses and shields both the mattress frame 18 and support frame 19.

The overall length of frame 18 is such that the ends of legs 138 (FIGS. 10–13) do not extend over end 96 of support frame 19. Thus, when frame 18 is in its generally horizontal position, legs 138 which are angularly related to the remainder of frame 18 extend downwardly away from platform 19 permitting mattress 17 to lie completely in a horizontal plane.

Referring now to FIGS. 16 and 17, a recess 175 (FIG. 16) is provided to accommodate handles 127 (FIG. 10) which are attached to the upper surface of frame 118. As mentioned earlier, handles 127 extend laterally to each side of the back support adjust frame 116 and since the sides of this frame lie within sides 95 of platform 19, the handles are attached to the upper surface and project over the upper surface of sides 95. The handle recesses 175 are positioned in the upper surface of groove 162 which is one reason that groove 162 is less in depth than groove 158. This is best illustrated in FIG. 17 which is a cross sectional view of mattress 17 taken along line 17—17 of FIG. 16.

FIGS. 17–22 represent various cross sectional views of underside 142 of mattress 17 and illustrate in detail the particular preferred configuration. As noted earlier, one primary objective is to provide a mattress having a low profile without sacrificing durability and comfort. FIGS. 17–22 illustrate a configuration for a mattress molded from ABS plastic which achieves these objectives. In the preferred embodiment, mattress 17 has a combined thickness of two inches. Preferably, the thickness should not exceed three inches or it becomes cumbersome to manipulate. In addition, mattress 17 is anchored to frame 19 to prevent it from sliding down as it is folded.

Having described one particular form of my invention in detail, its operation should be obvious. Briefly, the height of the bed surface (FIG. 1) from the floor is adjustable between what has been found to be an optimum range of 12–14 inches at its lowest elevation to the highest elevation of approximately 42 inches. The lower elevation is not only ideal when the bed is utilized as a playpen, but with the sides lowered, it permits a child to sit up naturally in bed with his legs extended over the side in contact with the floor. Selection of a particular height is achieved simply by operating a three-way switch to the up or down position so that bidirectional motor 41 through worm gear 43 rotates rod 45 which cooperates with vertical rod 51 and end post 13 through a pair of right angle beveled gears 49 and 50. Rotation of rod 51 provides axial displacement upwards or downwards of worm gear 54 which is anchored to end frame post 29 to raise or lower support frame 14 which includes mattress 17, mattress frame 18 and platform 19. Each end post 13 includes a lift mechanism 40 so that motor 41 simultaneously acts on both end frames of the bed.

A particular Trendelenburg position is achieved by simply pulling out on handle bar 98 (FIG. 10) so that the two connectors attached thereto are positioned with mid portion 103 aligned in slot 107 (FIGS. 3 and 4). At this position, connector 100 and hence platform 19 is free to move vertically in slot 107 into the upper, middle or lower position wherein connector 100 is aligned with one of the openings 108, 109 or 110. Having selected the desired position, the opposite force is exerted on handle bar 98 by pushing it inwardly until the larger cross sectional portion 114 of mid portion 103 is positioned in one of openings 108, 109 or 110 thus preventing further vertical movement in slot 107. The unique arrangement of plates 20 and connectors 100 provide positive and reverse Trendelenburg positioning as well as a means separate from lift mechanism 40 for adjusting the height of platform 19 and hence

mattress 17 from the floor elevation. That is, with both ends of platform 19 aligned in the same openings in slot 107, three levels of elevation are provided.

Mattress 17 is positionable at any angle from the horizontal to a vertical chair-like configuration by simply releasing fastener elements 126 (FIG. 10) to permit rotation of frame 116 into the desired angle with respect to platform 19. After loosening elements 126, the nurse or orderly simply lifts one of handles 127 and lifts the sub-frame to the desired position whereupon fastener elements 126 are tightened. To raise the knees, sub-frame 117 is rotated up until brace 141 is permitted to rotate into a vertical orientation as shown in FIG. 10. Upon release of sub-frame 117, the thigh and leg support is raised into the Gatch position. One particular illustration of a child in a generally upright Gatch position, is illustrated in FIG. 15.

With sides 15 in their lowermost position, it is thus simple to prepare the beds for occupancy by extending a sheet 141 over mattress 17 and simply folding the extending flap portion beneath the mattress and inserting the peripheral edges 168 intermediate fingers 167 of sheet keeper 164. The pinching effect of fingers 167 permit the sheet to be stretched tautly over mattress 17 presenting a very tidy appearance.

Referring briefly to FIGS. 1 and 2, the adjustment of sides 15 is likewise quick and easy. In its lowermost position, it is in the travel position and to raise it to the intermediate position, one simply raises it up until latch tubes 79 and 80 (FIG. 6) snap into place with slot 90 fitting into the first pair of notches 92 positioned at the upper end of the vertical portion of tambour tracks 58 and 60. If on the other hand, it is desired to raise the sides completely to the uppermost position, the nurse or orderly simply squeezes in on latch pins 84 and 86 preventing latch tubes 79 and 80 from snapping into the intermediate notches. Once the upper margin of side 15 clears the intermediate notches 92, pins 84 and 86 can be released since the side will remain in a travel position. Further lifting of the side will bring tubes 79 and 80 into alignment with upper notches 92. Should one arm of the nurse or orderly be occupied wherein it is difficult to grip pins 84 and 86 and at the same time lift side 15, the side can be locked into an opened travel position by simply squeezing pins 84 and 86 together and rotating them upwards into a horizontal position thereby rotating slot 90 into non-alignment with Tambour tracks 58 and 60 preventing it from catching in either of the intermediate or up position. Of course to lock it into one of these positions, the pins must be rotated downwardly again so that slots 90 are in alignment with Tambour tracks 58 and 60 for placement in one of the intermediate or upper notches 92. In accordance with the preferred embodiment, the sides are not locked in their lower positions. Should a side be in the intermediate or raised position and it is desired to manipulate it into one of the other positions, the same sequence of operation is available to the nurse or orderly as described herein. The frictional engagement between the ends of tubes 79 and 80 with tambour tracks 58 and 60 is such that regardless of the position of side 15, it will maintain itself in that position unless affirmatively gripped and motivated by an external force. Thus, the nurse or orderly need not worry about a side dropping rapidly downward once it is released from the upper or intermediate position if it is necessary to remove one's hand from the side.

Finally, either end panel 16 is removable from end 26 in the event that additional orthopedic equipment be utilized which extends out beyond the bed. Hence, in a situation such as the patient requiring traction, it may be desirable to remove one of the end panels. This is accomplished simply by flexing panel 16 inwardly until its upper margin clears keeper plates 38. As noted earlier the panels are preferably transparent and along with sides 15 provide essentially 360° omni vision into and out of the bed.

Referring now to FIGS. 24–31, bed 10 is shown in a variety of positions which illustrate in part although not completely, the flexibility of the bed for utilization as a crib, playpen or youth bed. FIG. 24 illustrates bed 10 in its optimum position as a playpen. Mattress 17 is in its lowermost elevation position which is approximately 12–14 inches above the floor. Both sides 15 are up with platform 19 positioned horizontally in its lowermost position as is Gatch frame 18. The Vexar netting makes this type of crib a very safe crib in addition to permitting a free flow of ventilation through the crib. The clear plastic end walls along with Vexar netting sides provide complete visability into the crib for the nurse or attendant to ascertain immediately where and what the child is doing.

FIG. 25 illustrates the bed in exactly the same arrangement as shown in FIG. 24 except that it is now raised to its extreme maximum position so that mattress 17 is approximately 42 inches from the surface of the floor. In this position, when the sides are up, bed 10 is particularly adaptable as a crib. The raised elevation makes it easy for the attendant or nurse to work in and around the crib without having to bend down too far.

Referring to FIGS. 28 and 29, bed 10 is shown exactly as shown in FIG. 24 except that in FIG. 28, one side 15 is in its lowermost position with the other being completely raised while in FIG. 29, both sides are in their lowermost position. In these instances, the bed is particularly adaptable for use with youths wherein the fear of the youth falling out of the bed accidentally is not great. On the other hand, if the youth is mobile, he may wish to enter or leave the bed by himself and therefore the overall elevation of the bed is determined by the particular size of the child. For instance, the child may many times wish to simply sit up in the bed with his feet extending over one side and resting on the floor. Of course by simple manipulation of lift means 40, the bed can be elevated to any desired position to accommodate a particular size child. Depending on the particular position of the bed in a particular room, it may or may not be desirable to have one of the sides up or down. In all four of the various positions described so far with reference to FIGS. 24, 25, 28, and 29, the bed support platform 19; mattress 18 and mattress 17 are in a completely horizontal flat position. In other words, it is particularly positioned for what is considered the normal horizontal bed configuration.

Referring now to FIG. 26, the bed is illustrated in a particular Gatch and Trendelenburg position. The Trendelenburg position is reversed in that the feet are elevated above the head. It is shown in the maximum reverse Trendelenburg position in that the right end of platform 19 is positioned in the lowermost position while the left end is in its highermost position. Also, the back support sub-frame has not been rotated so that the patients back will not be positioned angularly with

respect to platform **19.** However, the leg support sub-frame has been moved into the knees-up position.

FIG. **27** illustrates the bed in a particular Gatch position while the Trendelenburg angle is zero with platform **19** being located in the lowermost position of the Trendelenburg plate slots. In the particular position illustrated, the leg support sub-frame is actuated into the knees-up position and the back support sub-frame has been rotated relative to platform **19** to raise the back up so that the head is above the knees. In both FIGS. **26** and **27,** one of the sides is shown up in the intermediate position with the other it its lowermost position. The particular elevation of the bed as well as the positioning of the sides depends in large part on the mobility and age of the occupant.

Turning now to FIG. **30,** the bed is shown in the same position as that in FIG. **27** except that both sides are raised. This is particularly desirable if the individual involved is young and/or accidental falling is a consideration. In addition, it may be desired to raise the sides even in those cases wherein it is occupied by an older child when one of the objectives is to keep the child from getting out of the bed.

FIG. **30** illustrates the bed in a knees-up sitting position. The leg support sub-frame is raised to elevate the knees while the back is raised essentially into a vertical orientation, this particular position being very desirable for reading etc.

Although eight specific illustrations have been shown in FIGS. **24–31,** it will be appreciated that the flexibility and utilization of this bed far exceeds these eight illustrations.

Referring now to FIG. **32,** an alternative embodiment is shown wherein a modified mattress frame **18***a* and support platform **19***a* are shown. In this embodiment, instead of the mechanical interconnection between frames **18** and **19** discussed previously, support platform **19***a* is analagous to a pan in which Gatch frame **18***a* is seated. Pan **19***a* includes peripheral sides **190** having a stepped cross section to provide a lower floor **191** and a peripheral support flange **192** spaced upwardly from floor **191.** Frame **18***a* is adapted to rest on flange **192** and is comprised of tubular construction elements having an overall rectangular configuration capable of resting flat on flange **192** when the frame is in a non-gatch position. Frame **18***a* includes three subframe assemblies pivotally attached to each adjacent sub-assembly. Sub-frame **194** provides the leg supports; sub-frame **195** provides the thigh support; and sub-frame **196** provides the back support. Each sub-frame is pivotally interconnected to the adjacent subframe to provide manipulation into the knees-up, back-up position. Thus, frame **194** is pivotally connected to frame **195** while frame **195** is pivotally connected to frame **196** at **200.** A pair of pivotal legs **201** extend downwardly from each side of pivot **199** and a pair of similar legs **202** extend downwardly from pivot **200.** A vertical groove **203** is provided on each side of pan **19***a* from flange **192** to and slightly below floor **191** to permit tongue and groove engagement between grooves **203** and leg **201.** Preferably, leg **201** includes a cross bar **204** at its lower margin which extends laterally across the floor of pin **191** and rests in a laterally extending recess **205** when the leg is in its lowermost position. The foot end **206** of frame **194** is positionable in one or more keeper grooves **207** at the foot end of pan **19***a*. When it is desired to maintain frames **194** and **195** in a horizontal flat position, the foot end **206** is positioned in the left or rearmost keeper **208** with leg **201** vertically oriented in groove **203** and recess **205.** If it is desired to raise the leg and thigh support frames **194** and **195** into one or more Gatch (kness-up) position, foot end **206** is positioned in one of the keeper grooves **207** pivotally raising frames **194** and **195** as shown in FIG. **32.**

Regardless of the position of sub-frames **194** and **195** or for that matter sub-frame **196,** leg **202** is generally disposed in a groove and recess **210** and **211** identical to leg **201.** Leg **202** likewise includes a cross bar **212** similar to cross bar **204** on leg **201.** Leg **202** anchors mattress frame **18***a* so that the leg support sub-frames **194** and **195** can be manipulated into or out of the Gatch position.

With respect to the back support sub-frame **196,** the head end includes a pair of legs **215** extending downwardly between the side elements of frame **196.** The legs are spaced inwardly to clear the side portions of flange **192** so that the bottom cross bar **216** of legs **215** will rest in one of two detents **217** and **218** in the floor **191** of pan **19***a*. Legs **215** are also pivotable so that cross bar **216** rests in the lateral extending rear flange portion **219** of flange **192.** As legs **215** are pivoted for placement in detent portions **217, 218** or **219,** the slope of back rest **196** can be varied between the position shown in FIG. **32** and the two positions shown in phantom. If legs **215** are folded completely beneath sub-frame **196,** the back rest will be in a horizontal position with the cross bar at pivot **220** resting in indent portion **219** of flange **192.** As a result of the operation of the alternative embodiment shown in FIG. **32,** it will be readily apparent that a variety of alternative modifications are available in keeping with the overall concept of the inventions described herein. Although not shown, these alternative embodiments such as the one shown in FIG. **32** can be easily modified to include Trendelenburg positioning as well as the cooperation with a mattress such as the one described in detail.

Referring now to FIG. **33,** an alternative modification is shown for a support frame **14** and its enclosing sides **15** and end panel **16.** In its general overall concept, the bed illustrated in FIG. **33** is identical to that described with regards to FIGS. **1–31** and hence like numerals are used to designate like elements. With respect to the modified elements, the suffix *a* will be utilized.

In the embodiment shown in FIG. **33,** end panels **16** include an opening **230** covered by a detachable cap (not shown). Opening **230** permits the attachment of an oxygen hose **234** connected to an oxygen supply mechanism **236** the details of which are conventional and hence not described in detail. Thus, the bed envisioned by this invention includes an adaptation for artificially controlling the environment within support frame **14** or **14***a*. In order to more fully enclose the confines of support frame **14***a*, sides **15***a* are shown comprised of a clear plastic which is relatively thin. The sides are comprised of a plurality of narrow plastic strips **235** interconnected by living hinges **237** to permit free and easy movement along Tambour tracks **58***a* and **60***a* in accordance with my previous disclosure. Although it is not necessary to hermetically seal the internal portions of the bed, clear plastic sides **15***a* greatly reduced the flow of air into and out of the bed. In addition to this, bed **10***a* in FIG. **33** shows a removable top **240** comprised of a pair of cross bars **241** and **242** ex-

tending longitudinally the distance between end panels 16*a*. Interconnected between cross bars **241** and **242** and extending downwardly from each side are a plurality of plastic sheets **243**. Top piece **240** acts as a roof to the bed and fits snugly over and rests upon sides **15***a*. Although the use of top **240** is optional, it does greatly reduce any flow of air into and out of the crib or bed in those cases where the patient must be totally dependent on an artificial environment. In addition to the introduction of oxygen of course, it will be appreciated that medicated vapors etc. could also be introduced through one of the end panels **15***a*. Although not shown, in accordance with the embodiments shown in FIGS. **1–32**, it is envisioned that a thin plastic sheet of polyethylene could be draped over the bed to likewise provide an environment within the bed capable of artificial support. Thus, oxygen could be supplied to a bed utilizing the Vexar siding.

Referring now to the base assembly **11***a* of the embodiment shown in FIG. **33**, a pair of generally U-shaped frame elements **250** and **251** are shown extending from the mid portion of channel frame **21**. One of the frame portions **250** acts as a guard for motor **41** in that the legs **252** and **253** extend from each side of motor **41**. In addition to protecting the motor however, frames **250** and **251** provide a means for mounting trays on base frame **11***a*. One of these trays **255** is shown mounted between leg **253** and cross bar **27**. In the preferred embodiment, tray **255** includes an outwardly projecting flange **256** around its peripheral upper portion which flange rests on portions of cross bar **27**, channel frame member **21** and leg **253**. Such trays permit the storage of particular equipment necessary to service the patient occupying the bed putting them in a close accessible position and yet shielded from accidental bumping or moving.

Having described the various details and advantages provided by this invention, and although several alternative forms have been shown and described in detail, it will be obvious to those having ordinary skill in this art that the details of construction of these particular embodiments may be modified in a great many ways without departing from the unique concepts presented. It is therefore intended that the invention is limited only by the scope of the appended claims rather than by particular details of construction shown, except a specifically stated in the claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A pediatric bed comprising, in combination: a support base; an enclosure means; and means for raising and lowering said enclosure means relative said base, said enclosure means including a pair of end panels, sides, and body support platform, at least one of said sides being slidable relative said support platform and movable between a first position wherein the top margin of said side is at or below said body support platform during at least a range of positions of said enclosure means relative said support base, a second position wherein the top margin is substantially above said body support means regardless of the position of said enclosure means relative said support base, and a third position intermediate said first and second positions; and latch means for releasably positioning said sides in said positions.

2. The pediatric bed according to claim **1** wherein said side when positioned in said third position has its upper portions extending generally vertically upwards, and when positioned in said second position has a first portion extending generally vertically upwards, and a second portion above said first portion sloped inwardly over said body support platform.

3. The pediatric bed according to claim **2** wherein both said sides are slidable relative said support platform independently of each other.

4. The pediatric bed according to claim **1** wherein the top margin of said movable slide is at or below said body support platform regardless of the position of said enclosure means relative said support base when said side is in said first position.

5. The pediatric bed according to claim **1** wherein said side is disposed in a generally horizontal fashion beneath said platform means when positioned in said first position.

6. The pediatric bed according to claim **1** wherein said body support platform includes a back support portion and leg support portion hingedly related to each other, said leg support portion having an upper and lower support portion hingedly related to each other, each of said supports being movable for joint or relative rotation with respect to each other about a horizontal axis.

7. The pediatric bed according to claim **6** wherein said upper and lower leg portions are positionable relative to each other in an angular relationship at a fixed degree so that when said leg support portion is rotated, the upper and lower legs of a patient occupying said bed will be bent at a preselected angle.

8. The pediatric bed according to claim **7** wherein means of providing for maintaining said leg support portion at a desired angle for rotation relative to the horizontal.

9. The pediatric bed according to claim **8** wherein said means is comprised of a brace mounted at one end to said leg support portion and swingable downwardly so that its lower end abuts against said frame to maintain said leg support portion at an elevated position angularly related to the horizontal.

10. The improvement according to claim **1** wherein said end panels are transparent, at least one of said end panels being detachably connected to said enclosure means without requiring the utilization of mechanical fasteners.

11. The improvement according to claim **1** wherein said end panels are comprised of a generally rigid plastic, at said least one of said end frames including means for holding the edge of said panel to prevent removal thereof, said panel being flexible to permit insertion and removal from said holding means.

12. The improvement according to claim **11** wherein at least one of said panels include one or more openings, said openings being closed by detachable caps which permit the attachment and introduction of environmental control means into the bed atmosphere.

13. The improvement according to claim **1** wherein said sides are comprised of a mesh-like, see-through material which is resiliently yieldable, said sides including a pair of opposed side margins comprised of semi-rigid stripping, said end frames including guide means operatively associated with said stripping and latch means to confine the movement of said sides between said positions.

14. In an improved pediatric bed having a pair of end frames interconnected to each other, a pair of sides interconnected to said end frames, and a body support platform means having a mattress thereon, the improvement comprising: at least one of said sides being slidably mounted to said end frames and movable between a first position wherein the top margin of said side is at or below said platform means, a second position wherein the top margin is substantially above said platform means, and a third position intermediate said first and second positions; and latch means for releasably positioning said side in said positions, said side when positioned in said third position having its upper portion extending generally vertically upwards, and when positioned in said second position having a first portion extending generally vertically upwards, and a second portion above said first portion sloped inwardly over said body support platform means, said sides being comprised of a mesh-like, see-through material which is resiliently yieldable, said movable side including a pair of opposed side margins comprised of semi-rigid stripping, said end frames including guide means operatively associated with said stripping, said guide means being comprised of a pair of rails, one on each end frame, said semi-rigid stripping including a plurality of ring means operably associated with said rails.

15. The improvement according to claim 14 wherein said movable side is generally disposed in a horizontal fashion beneath said platform means when positioned in said first position.

16. In an improved pediatric bed having a pair of end frames interconnected to each other, a pair of sides interconnected to said end frames, and a body support platform means having a mattress thereon, the improvement comprising: at least one of said sides being slidably mounted to said end frames and movable between a first position wherein the top margin of said side is at or below said platform means, a second position wherein the top margin is substantially above said platform means, and a third position intermediate said first and second position; and latch means for releasably positioning said side in said positions, said side when positioned in said third position having its upper portion extending generally vertically upwards, and when positioned in said second position having a first portion extending generally vertically upwards, and a second portion above said first portion sloped inwardly over said platform means, said sides being comprised of a mesh-like, see-through material which is resiliently yieldable, said movable side including a pair of opposed side margins comprised of semi-rigid stripping, said end frames including guide means operatively associated with said stripping, said upper margin of said movable side being comprised of a generally tubular member extending the width of said sides, said latch means including a gripping member associated with said tubular member and engageable with stop means on said guide means to lock said movable side selectively in one of said positions, said gripping members being slidable between an extended position wherein said gripping member extends into engagement with said stop means to prevent further lowering movement of said side below said particular position and a retracted position wherein said gripping members are retracted longitudinally with respect to said stop means to release said gripping member from said stop means to permit adjustment of the height of said side.

17. The improvement according to claim 16 wherein said latch means is comprised of a pair of rods mounted within said tubular member, for telescoping movement relative thereto, said tubular member including a pair of axially spaced, longitudinally extending slots, each of said rods including a latch pin extending radially therefrom for projection respectively through said slots, said pins when positioned axially outwards in abutment with the outer wall of each of said slots positioning said latch means in said extended position for engagement with one of said stop means to lock said side in one of said positions, said posts when moved axially inwardly toward each other in abutment with the inner walls of said slots positioning said latch means in said retracted position to release said side for sliding movement in said guide means.

18. The improvement according to claim 17 wherein said latch means includes means for biasing said rods outwardly into said extended position.

19. The improvement according to claim 18 wherein said biasing means is comprised of spring means operable betweens said rods urging said gripping members outwardly.

20. The improvement according to claim 16 wherein said guide means is comprised of a rail mounted on each side of said end frame to space said side margins inwardly from said end frames, said gripping members being comprised of a recess extending axially inwards from the outer end of each rod and adapted to enclose a portion of said rails, the cross-sectional width of said recess being less than the cross section of said rails, said stop means comprising a notch engageable by said recesses on said gripping member when in said extended position to prevent further vertical movement of said side, said notch being disengaged by said gripping members when said members are in said retracted position.

21. The improvement according to claim 20 wherein said rods are rotatable jointly about their axis when said rods are in said retracted position between a first position wherein said recesses are in alignment with said rails to permit said rods to be extended into said notches and a second position wherein said recesses are misaligned with said rails to prevent said rods from extending into said notches.

22. The improvement according to claim 21 wherein said rods when in said retracted position are frictionally engaged with said rails to prevent said side from being lowered in the absence of a positive external force.

23. The improvement according to claim 16 wherein said tubular member extends beyond said rails and includes a pair of aligned openings for receipt of said rails.

24. In an improved pediatric bed having a pair of end frames interconnected to each other, a pair of sides connected to said end frames, and a body support platform means having a mattress thereon, the improvement comprising: at least one of said sides being slidably mounted to said end frames and movable between a first position wherein the top margin of said side is at or below said platform means, a second position wherein the top margin is substantially above said platform means, and a third position intermediate said first and second position; and latch means for releasably positioning said sides in said positions, said side when positioned in said third position having its upper portion extending generally vertically upwards, and when posi-

tioned in said second position having a first portion extending generally vertically upwards, and a second portion above said first portion sloped inwardly over said platform means, said sides being comprised of a mesh-like, see-through material which is resiliently yieldable, said mesh-like material being permeated with openings dimensionally small enough to prevent the insertion of an infant's finger therethrough, said movable side including a pair of opposed side margins comprosed of semi-rigid stripping, said end frames including guide means operatively associated with said stripping.

25. In an improved pediatric bed having a base frame mounted on casters; at least one generally upstanding end post affixed to each end of said base frame; an enclosure means suspended from said end posts, said enclosure means comprising a pair of end frames rigidly interconnected to each other, each of said frames being mounted to each of said posts respectively, side means interconnected to said end frames; means for raising and lowering said enclosure means relative to said base frame; and a body support means suspended from said enclosure means; the improvement comprising: said body support means comprising a rigid generally rectangular support frame connected at each end to said end frames, said support frame being adjustable to permit raising or lowering each end thereof jointly or independently of each other with respect to said enclosure means.

26. The improvement according to claim **25** wherein said support frame includes means extending longitudinally from each end thereof and operatively associated with means on said end frames for support of said support frame, said end frames including means for adjusting the vertical orientation of said support frame.

27. The improvement according to claim **26** wherein said means on said end frame is comprised of a plate mounted on each side of said end frame and having a vertically oriented elongated slot there in, said slot having an upper and lower enlarged aperture, the diameter of which exceeds the width of said slot, said longitudinally extending means including lock means for selectively locking said extension means selectively in one of said apertures to position said respective support frame ends in one of said upper or lower positions.

28. The improvement according to claim **27** wherein said lock means is comprised of a connector member affixed to the outer end of said longitudinally extending means on each corner of said support frame, each of said connector members including a midportion inserted within said plate slots and having a first cross-sectional portion exceeding the diameter of said slot, and a second cross-sectional portion less than the diameter of said slot, said second portion when aligned in said slot permitting free vertical movement of said connector member in said slot, said first portion when aligned in one of said enlarged apertures preventing vertical displacement of said connector member in said slot.

29. The improvement according to claim **28** wherein said connector members are attached to said longitudinally extending means for endwise movement relative thereto to selectively permit movement of said connector members endwise so that the second portion of said connector members is positionable in said slot or aperture.

30. The improvement according to claim **29** wherein the cross-sectional diameter of one of said apertures in said plates is greater than the maximum cross-sectional diameter of said connector members to permit endwise insertion of said connector members through said plates.

31. The improvement according to claim **28** wherein a generally U-shaped handle bar is connected at each end to a pair of connector members on each end of said bed to permit simultaneous endwise movement of said pair of connector members relative to said plates.

32. The improvement according to claim **28** wherein said plates include one or more apertures positioned vertically intermediate said upper and lower enlarged apertures to permit greater flexibility in vertically adjusting the position of each end of said body support means.

33. In an improved bed having a body support means including a mattress support frame, and a mattress mounted on said mattress frame, the improvement comprising: said mattress comprising a back support portion and leg support portion hingedly related to each other, said leg support portion having an upper and lower leg support portion hingedly related to each other, each of said supports being movable for joint or relative rotation with respect to each other about a horizontal axis, said mattress support frame including an adjustable back support subframe and an adjustable leg support subframe, said subframes being rotatable relative to each other for corresponding movement of said mattress support portions, wherein the underside of said mattress includes a generally continuous groove dimensioned to receive said mattress frame so that said mattress and frame appear to be unitary.

34. The improvement according to claim **33** wherein said leg support subframe is comprised of an upper leg portion and a lower leg portion, said upper and lower leg portions being adjustable endwise to adapt to patients of various sizes, said mattress including hinge means between said corresponding upper and lower leg support portions adapted to adjust to the endwise positioning of said upper and lower leg support subframe.

35. The improvement according to claim **34** wherein the underside of said mattress is comprised of plastic, and said hinge means intermediate said upper and lower leg support portions are characterized as a plurality of longitudinally spaced living hinges permitting said mattress to bend at the position of a patient's knees at selected dimensional endwise positions of said leg support sub-frame.

36. The improvement according to claim **33** wherein the underside of said mattress is comprised of plastic and said hinge intermediate said back support portion and upper leg portion is characterized as at least one living hinge extending laterally the width of said mattress to permit bending of said mattress portions relative to each other as said back support subframe is rotated angularly relative to said enclosure means.

37. The improvement according to claim **36** wherein said back support subframe includes one or more handles extending laterally therefrom to permit manual rotational adjustment of said back support subframe, said mattress including one or more recesses in its underside for receipt of said handles.

38. The improvement according to claim **33** wherein said mattress includes means on its underside for retaining the edges of a sheet in a tight fashion.

39. The improvement according to claim **38** wherein said retention means is comprised of a generally contin-

uous gripping member disposed along the periphery of the underside of said mattress for detachably anchoring the peripheral edges of a sheet thereto.

40. The improvement according to claim **39** wherein said mattress includes a second generally continuous groove disposed in the underside thereof positioned outwardly from said first groove adjacent the peripheral edge of said mattress, said retention means including elongated channel portions disposed in said groove for snug engagement therewith to anchor said channel means in said groove, said channel means including a pair of inwardly bent finger-like portions resiliently biased against each other to permit insertion of the edges of a sheet therebetween for gripping same to retain said sheet to said mattress.

41. The improvement according to claim **40** wherein said channel portions are comprised of extruded plastic.

42. In an improved bed having a body support means including a mattress support frame, and a mattress mounted on said mattress frame, the improvement comprising: said mattress comprising a back support portion and leg support portion hingedly related to each other, said leg support portion having an upper and lower leg support portion hingedly related to each other, each of said supports being movable for joint or relative rotation with respect to each other about a horizontal axis, the upper portion of said mattress being comprised of a foam cushion and the bottom portion being comprised of plastic, the overall profile of said mattress being extremely low to facilitate bending without wrinkling.

43. The improvement according to claim **42** wherein said bottom portion of said mattress includes a flat upper surface, said foam portion being affixed to said upper surface, the overall combined height of said cushion and support portion being less than 3 inches.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,763,507 Dated Oct. 9, 1973

Inventor(s) Robert L. Propst

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Abstract, line 3; "bv-" should be --- be- ---;

line 4; "a9e" should be --- are ---;

line 8; "aujustable" should be --- adjustable ---;

line 10; "thv" should be --- the ---.

Column 2, line 44; "through" should be --- though ---.

Column 13, line 39; "Trendelenburg" should be --- the ---;

line 40; the word "trendelenburg" should begin with a capital T.

Column 17, line 16; "142" should be --- 141 ---.

Column 26, line 35; "of providing" should be --- are provided ---;

line 36; "for" should be --- of ---.

Signed and sealed this 18th day of February 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

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