UNITED STATES PATENT OFFICE

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INVALID LIFTING APPARATUS


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5-Claims. (Cl. 5—86)

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1. This invention relates to an invalid-lift and more particularly to an improved construction of a portable lifting device which is designed to be readily moved into position and operated to remove a helpless invalid from a bed and to place him thereon without minimum of discomfort or pain to the invalid.

Among the principal objects of the present invention is to provide an elevator type of invalid carrier or stretcher which is characterized by the fact that it comprises a support which is adapted to be placed in position immediately adjacent a bed and which, in turn, is fitted with a frame the marginal elements of which are respectively adapted for insertion through the marginal edges of a flexible sheet disposed beneath an invalid recumbent on the bed.

While the invalid-lift of the present invention is well adapted and in fact intended for transporting hospital patients to and from their beds, it is especially advantageous for use as an elevator to vertically lift the invalid above the bed as when it is necessary to change bed linens or otherwise render the bed more comfortable for the invalid. To this end, the lift of the present invention includes as an important element thereof, a specially constructed flexible stretcher sheet which may be readily placed beneath the body of the invalid recumbent on the bed and which then may be marginally engaged by a frame to not only support the stretcher sheet in a vertically supported condition. Also, it is advantageously provided with a pair of main supporting units which are adapted for detachable support upon an elevator structure as to provide for easy raising or lowering of the invalid supported upon the stretcher. The elevator structure is adapted for detachable horizontal support and is adapted for ready assembly into the form of a rigid stretcher frame and which frame is so adapted for detachable support, and which includes an elevator structure as to provide for easy raising or lowering of the invalid supported upon the stretcher. The elevator structure is adapted for detachable support and is adapted for ready assembly, and the whole apparatus being thus of a knock-down construction which facilitates storage thereof, when not in use, in a small space.

Other novel features and advantages of the invalid-lift as constructed in accordance with the present invention will appear more fully hereinafter. It being understood that the said invention consists in the combination, construction, location and relative arrangement of parts, all as described in detail hereinafter, as shown in the accompanying drawings, and as finally pointed out in the appended claims.

In the accompanying drawings which illustrate a preferred construction of the apparatus—

Figure 1 is a perspective view showing the assembled lift with its invalid-supporting stretcher in elevated position;

Figure 2 is a vertical sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 1;

Figure 5 is a sectional detail as taken on the line 5—5 of Figure 1;

Figure 6 is a horizontal sectional view as taken on the line 6—6 of Figure 8;

Figure 7 is a plan view of the apparatus as viewed along the line 7—7 of Figure 1;

Figure 8 is a plan view of the flexible stretcher sheet and associated frame elements for maintaining the same taut when in invalid-supporting position;

Figure 9 is an end-elevational view illustrating the mode of operation of the lift of the present invention, the frame stretching being shown in full line upon a bed supporting the invalid to be lifted, while the supporting structure for the stretcher is shown in full line spaced laterally from the bed and in dotted line adjacent the bed and in operative association with the stretcher;

Figure 10 is a detail view as viewed when taken along the line 10—10 of Figure 9.

Referring now to the drawings and more particularly to Figures 1 and 7, it will be observed that the lifting apparatus of the present invention generally comprises a pair of main supporting units 10 and 11 and a stretcher unit 12 adapted for operative association to support an invalid in any desired elevated position above a bed.

Each of the main supporting units 10 and 11 is provided with a pair of horizontal rails 13 and 14 arranged substantially at right angles to each other and with a vertically extending post member 15 rising from the point of juncture of the angularly related horizontal rails. The rails 13 and 14 of each supporting unit are fitted adjacent their extremities with caster wheels 16 having mounting yokes 17 suitably swivelled, as at 18 (see Figure 8), within the rails, so that the apparatus may be readily moved about. Preferably, the horizontal rails 13 and 14 and the vertical posts 15 are formed of channel-shaped metal, such as aluminum, the rails being fitted in their respective ends with suitable bearing blocks 19 for the shanks of the caster wheel yokes 17. Of course, any other suitable arrangement may be provided for swivel mounting of the caster wheels. The vertically extending post member 15 of each of the supports 10 and 11 is preferably formed of a pair of laterally spaced channel mem-
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3 bers 15—15 the upper ends of which are suitably secured together by braces 21—21, while their lower ends are secured together by gusset plates 22—22 which additionally serve to secure the post member 15 to the horizontal rails in fixed vertical relation thereto. The rails 13 and 14 of each support are themselves secured together against relative angular displacement by a horizontal gusset plate 23, from whence it will appear that each supporting unit is in the form of a rigid, self-sustaining structure providing adequate support for its vertical extending post member 15.

The two supporting units 10 and 11 are adapted to be assembled, as shown most clearly in Figure 1, with their rails 13—13 in longitudinal alignment, while their rails 14—14 extend in spaced parallel relation to one side of the aligned rails. When so assembled, the post members 15—15 of the supporting units are disposed in laterally spaced vertically extending parallel relation. To facilitate longitudinal alignment of the rails 13—13, their proximate ends are respectively provided with a longitudinally slidable bar 24 and a key-way 25 which when interengaged, as shown in Figure 2, prevent lateral displacement of the rails 13—13 relatively to their common longitudinal axis while permitting their free relative movement along said axis. Slidably disposed within each post member 15 is a vertically extending toothed rack 26 the upper end of which is provided with a thickened body portion 27 having a pair of grooves 28—28 respectively formed along its opposite edges. These grooves 28—28 respectively accommodate therein the proximate vertical edges of the inner side walls 26—29 of the channel members 15—15, thereby providing for free rectilinear movement of the toothed rack 26 vertically within the post member 15 while preventing lateral displacement of the rack relatively to its guided path of travel.

In order to effect vertical movement of the rack 26 within its guide 15, the latter is fitted at a suitable point intermediate its length with a rotatable worm 30 in mesh with a worm wheel 31 suitably keyed to a shaft 32 journaled between the opposite base walls of the post channel members 15—15. The meshed worm 30 and worm wheel 31 are disposed externally of the post member 15, the shaft of the worm being suitably provided with an extension for receiving a detachable operating handle 33 for rotating the worm and the worm wheel 31 in mesh therewith.

Keyed to the worm wheel shaft 32 within the post member 15 is a pinion gear 34, this latter being in such constant engagement with the toothed rack 26 that rotation of the worm 30, by means of the handle 33, in one direction or the other raises or lowers the rack vertically within the post. The gear train is such that the rack remains stationary in any vertically adjusted position thereof, although any suitable additional means (not shown), such as a spring-pressed detent operative upon the gear 32 or upon a ratchet wheel fixed thereto, may be employed for locking the rack in its vertically adjusted position.

Secured to the proximate portion 37 of the rack 26, as by the bolts or studs 35, is a transversely extending horizontally disposed rod 36 of a length approximately equal to that of the base rail 14. The rod 36 of each supporting unit is disposed in the vertical plane of the base rail 14 and is adapted for vertical movement in said plane as the rack 26 is raised or lowered by the operating handle. It will be apparent, of course, that the rods 36—36 of the supporting units 10 and 11 as assembled as shown in Figure 1 are at all times maintained in parallel relation and that by proper manipulation of the racks 26—26 respectively associated with the assembled supporting units they may be positionally adjusted to lie in a common horizontal plane or in a plane inclined somewhat with respect to the horizontal.

The rods 36—36 are designed to support a flexible stretcher sheet 37 suitably stretched over a supporting frame composed essentially of a plurality of interconnected frame elements presently to be described. The stretcher sheet 37 itself is formed of any suitable frame material of requisite strength, such as canvas, its marginal edges being turned and sewed along the lines 38 to provide hems 39 for respective reception of the elements constituting the supporting frame for the stretcher sheet. In order to facilitate insertion of these frame elements, the corners of the stretcher sheet are cut away, as at 40.

Referring now more particularly to Figures 7 and 8, it will be noted that the supporting frame for the stretcher sheet 37 comprises a pair of longitudinal tubular rods 41—41 and a pair of transverse tubular rods 42—42. Each of the longitudinal tubular rods 41—41 is provided, at least in one end thereof, with an adapter element 43 having an interiorly threaded body portion 44 adapted to snugly fit internally of the tubular rod and an enlarged head 45 adapted to bear against the end of the rod. Adapted for-threaded insertion into the adapter element 43 is a screw nut 46 the outer end of which is provided with an integral or otherwise firmly secured collar 47 the internal bore of which is of a diameter to snugly receive the vertically adjustable supporting rod 36 of the main supporting unit. The transverse tubular rods 42—42 are each of the same internal diameter as that of the collars 47—47. In consequence of which each rod 36 is adapted to pass through the axially aligned internal bores of each transverse rod 42 and the collars 47—47 disposed at opposite thereof (see Figure 7), the collars 47—47 being, of course, each threadedly connected to an adapter 43 fitted in the end of the longitudinally extending rod 41.

The transverse tubular rods 42—42 serve as spacers between each pair of the collars 47—47 associated with each such rod and maintain each pair of collars in such spaced relation and lengthwise of their supporting rod 36 as to prevent transverse collapse of the flexible stretcher sheet 37 when the longitudinal edges thereof are engaged by the longitudinal rods 41—41 respectively supported between the collars 47—47 and their adapter elements 43—43. The spacing between the vertically adjustable supporting rods 36—36, when the main supporting units 10 and 11 are properly assembled as shown in Figure 1, defines the longitudinal tautness of the stretcher sheet 37, such spacing relation and that 36—36 being adjustable within limits by means of the adapter elements 43. In this latter connection it will be apparent that having engaged the sheet 37 with its several frame elements 41—41—42 to provide a more or less rigid rectangular supporting frame for the material having projected the supporting rods 36—36 respectively through the transverse tubular rods 42—42 and their associated collars 47—47 carried by the longitudinal tubular rods 41—41, each rotating an adapter element 43 relatively to the rod 41 in which it is fitted, the collars member 47 threadedly connected to said adapter.
element will be shifted outwardly of the latter to increase the effective length of the longitudinal rod of the stretcher frame and so stretch the sheet 37 to its desired degree of tautness. Of course, all of the collar members 41 should be correspondingly adjusted to insure uniform stretch of the sheet 37 along both of its longitudinal edges and to insure that the corresponding pairs of the frame elements are disposed in substantial parallelism.

In operation of the apparatus of the present invention, the flexible stretcher sheet 37 is first placed on the bed (shewn dotted in Figure 9) beneath the invalid to be lifted from the bed. The longitudinal rods 41-41 and the transverse rods 42-42 of the stretcher frame are then inserted into the hemmed edges of the stretcher sheet. Thereupon, the adapter elements 43 fitted with their axially adjustable collars 47 are inserted into the ends of the longitudinal rods 41-41 of the stretcher frame, following which the support consisting of the assembled units 16 and 11 is wheeled from its full line position shown in Figure 9 into its dotted line position as shown therein, the racks 26-26 having first been lowered by suitable manipulation of the handle 33 (the same handle may be employed for alternate operation of both racks or two handles may be employed for simultaneous operation therewith) to present the rods 35-36 in position for insertion through the bores of the transverse rods 42-42 and the tensioning collars 47 of the stretcher frame. Upon suitable adjustment of the adapter elements 43, the stretcher sheet 37 is tensioned upon the frame, following which the stretcher with the invalid recumbent thereon may be lifted vertically above the bed and so transported, if desired, away from the bed. To replace the invalid upon the bed, the operation above described is reversed, the stretcher being wheeled into position above the bed and then lowered, following which the collars 47 are adjusted to release the stretcher sheet 47 of its tension and permit withdrawal of the wheeled support from the bed and removal of the frame elements from the stretcher sheet 37. The latter may then be removed from beneath the invalid, if so desired.

By virtue of the collapsible character of the apparatus of the present invention, the several elements thereof may be assembled in compact form for storage in limited space. It will be noted that the apparatus may be assembled and disassembled without the necessity of employing any tools, all of the relatively adjustable parts thereof being designed for hand manipulation.

It will be understood that the apparatus is susceptible of various changes and modifications which may be made from time to time without departing from the general principles or real spirit of the present invention, and it is intended accordingly to claim the same broadly, as well as specifically, as indicated in the appended claims.

What is claimed is:
1. In an invalid lifting device of the character described, a portable structure including a pair of freely projecting support rods arranged in parallel relation and adapted for disposition transversely across the top of a bed and means for positionally adjusting said rods in spaced relation above said bed, a flexible stretcher member adapted for disposition beneath the body of an invalid recumbent on the bed, and a separable frame for said stretcher member adapted to support the latter in taut condition from said rods, said frame including a pair of tubular rods respectively disposed at opposite extremities of said stretcher member and respectively adapted to be fitted over said rods so as to be supported thereby.

2. In an invalid lifting device of the character aforesaid, a flexible stretcher sheet adapted for disposition beneath the body of an invalid recumbent on a bed, a separable frame for said stretcher sheet comprising one pair of tubular members extending widthwise of the sheet and a second pair of members extending lengthwise thereof, the members of said second pair being provided at each end thereof with a coupling element terminating in a collar adapted for axial registry with a tubular member aforesaid, and a pair of vertically adjustable supporting rods projectable through each of said tubular members and the collars axially in registry therewith to support said stretcher sheet extended between said frame members.

3. In an invalid lifting device of the character described, a flexible stretcher sheet adapted for disposition beneath the body of an invalid recumbent on a bed, a separable frame for said stretcher sheet comprising one pair of transversely extending tubular members adapted for respective securement to one pair of parallel edges of said sheet and a second pair of longitudinally extending members adapted for respective securement to another pair of parallel edges of said sheet, coupling elements associated with said longitudinally extending members for increasing the effective lengths thereof, each of said coupling elements including an annular extremity having a bore adapted for registry with the bore of an adjoining transversely extending member, and means operative commonly to interconnect said frame members at each corner of the stretcher sheet and to support the latter in stretched condition upon each frame member.

4. In an invalid lifting device as defined in claim 3 wherein said interconnecting means for the frame members is in the form of a pair of rods respectively insertable into the bores of said transversely extending members and the axially registered openings in said coupling elements.

5. In an invalid lifting device of the character defined in claim 1 wherein the means for positionally adjusting said support rods comprises pinion-actuated racks rectilinearly movable in vertically extending standards forming parts of said portable structure.

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