

June 4, 1963

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3,091,778

HOIST FOR USE IN COMBINATION WITH BATHTUB

Filed Oct. 19, 1959

3 Sheets-Sheet 1

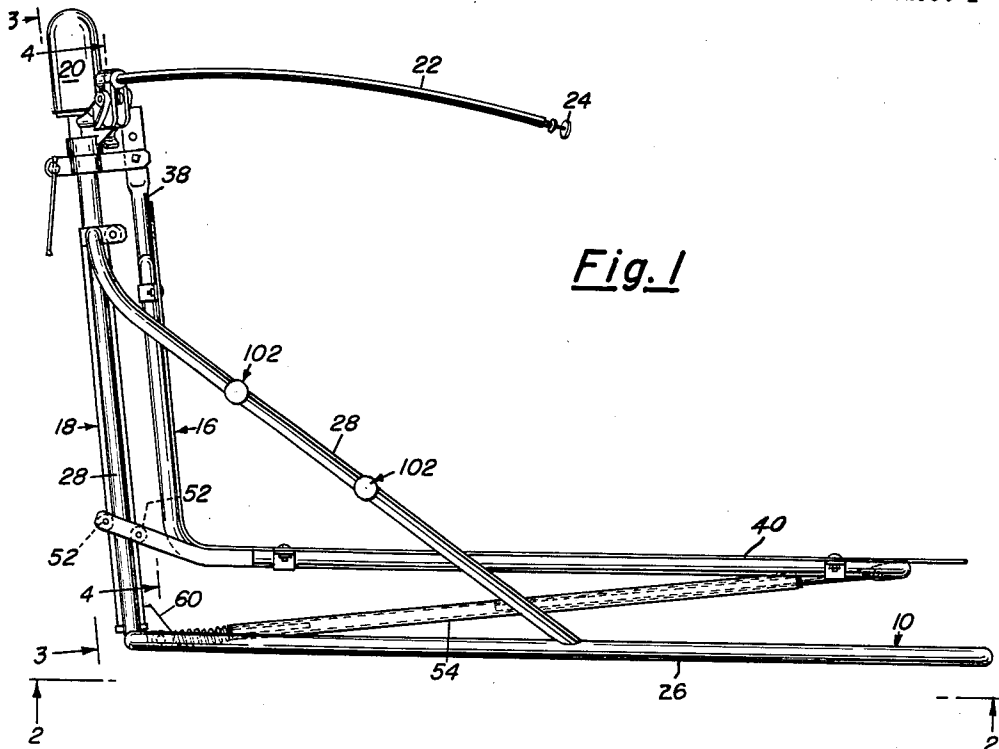


Fig. 1

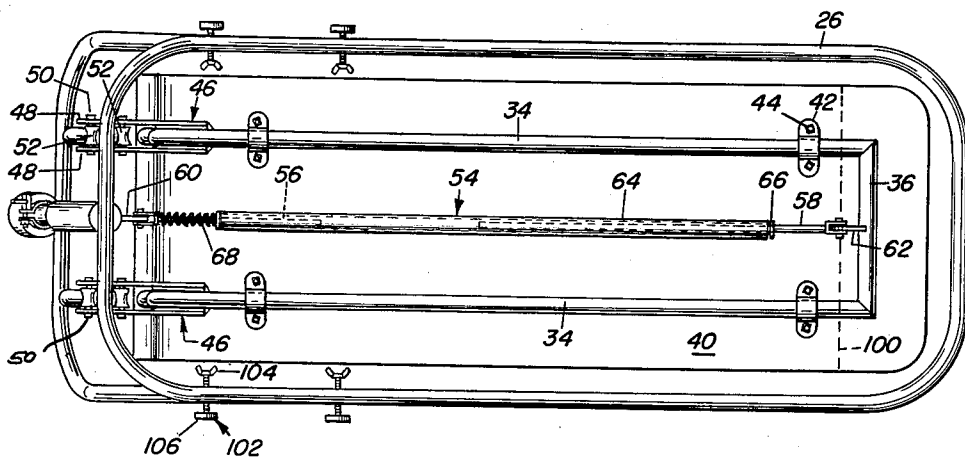


Fig. 2

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HOIST FOR USE IN COMBINATION WITH BATHTUB

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Filed Oct. 19, 1959, Ser. No. 847,123
2 Claims. (Cl. 4-185)

The present invention relates to a hoist for use by invalids and the like in getting into and out of a bathtub, and more particularly relates to such a hoist which may be operated by the user without the assistance of others.

According to the present invention, there is provided a hoist which is designed for use in combination with a bathtub, the hoist being supported by the bathtub and operable by the user to raise and lower the user to facilitate getting out of and into the bathtub, respectively. Many individuals of advanced age, who are incapacitated by injury or illness find it very difficult to bath without the assistance of a nurse or a member of the family, and the present invention provides a simple and convenient means for making it possible for these individuals to use a bathtub without the assistance of others.

The present hoist comprises a stationary frame which rests upon the bathtub, and which includes a substantially vertical section which includes a track or other guide means for a movable frame. The movable frame constitutes the platform for supporting the individual, and it is guided upwardly and downwardly by the vertical section of the stationary frame. Fluid actuated means such as a hydraulic pump or ram is connected between the stationary frame and the movable frame, and preferably includes an elongated arm which may be pumped up and down by the user of the present hoist to effect a raising of the movable frame. Thus, it will be seen that the individual is only required to exert a minimum effort to raise himself to a position where he can swing his legs over the edge of the tub and onto the floor.

The present hoist is constructed of light weight, tubular components which are rigidly secured together to form a stable support for the individual. Novel strut means are connected between the stationary and movable platforms for steadying the movable platform while yet permitting unhampered movement of the movable platform in a vertical direction. Such strut means, together with the light weight tubular construction of the majority of the components of the hoist provides strength for minimum weight. One form of the present invention has been constructed which weighs as little as thirty pounds, making it possible for the hoist to be lifted out of the bathtub to enable normal use of the bathtub without the hoist.

The form of fluid actuated means used for effecting the raising and lowering of the movable frame is particularly well adapted for use by an invalid, for example. The piston and element forming the cylinder of the fluid actuated means provide a hydraulic ram section which extends longitudinally in a substantially vertical direction, and, by reason of their interconnection with the other components, serve to provide strength for the stationary platform. That is, in addition to performing their function as a hydraulic ram, the piston and cylinder sections afford a structural reinforcement for the stationary frame.

The hoist according to the present invention is simple to construct and is easily disassembled. Most of the components of the hoist are readily available on the market, and, accordingly, the cost of such a hoist is comparatively low.

Other objects and features of the present invention will be readily apparent to those skilled in the art from the following specification and appended drawings where-

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in is illustrated a preferred form of the invention, and in which:

FIGURE 1 is a side elevational view of a hoist according to the present invention, the movable platform being illustrated in a slightly raised position;

FIGURE 2 is a view taken along lines 2-2 of FIGURE 1;

FIGURE 3 is a view taken along lines 3-3 of FIGURE 1;

FIGURE 4 is a view taken along lines 4-4 of FIGURE 1;

FIGURE 5 is a partial cross sectional view taken along lines 5-5 of FIGURE 3; and

FIGURE 6 is a side elevational view of the hoist of FIGURE 1 in position within a bathtub, the full lines indicating the depressed position of the movable frame, and the phantom lines indicating the raised position of the movable platform.

The hoist according to the present invention comprises, generally, a stationary platform or frame 10 which rests upon the usual bottom wall 12, FIGURE 6, of a bathtub 14. This stationary frame 10 provides the principal structural strength and rigidity for a movable frame 16 which, as will be seen, is supported and guided in a vertical direction by elongated guide elements which form a part of stationary frame 10. Stationary frame 10 also serves to support the fixed or stationary end of a fluid actuated means or hydraulic ram 18, the other or movable end of the hydraulic ram being connected to movable frame 16.

Hydraulic fluid is introduced into hydraulic ram 18 by a fluid pump means or hydraulic jack 20 which is operated by manual manipulation of an elongated extension or arm 22. In this way, the operator or user of the present hoist manipulates arm 22 to raise movable frame 16 to the position shown in phantom outline in FIGURE 6. The user then eases his weight onto movable frame 16 and operates a hydraulic relief valve in jack 20 by pushing button 24 at the end of arm 22, as will be hereinafter more completely described. This permits the weight of the user to carry movable frame 16 downwardly to the position illustrated in full lines in FIGURE 6.

Stationary frame 10 is made up of light weight tubular components, such as aluminum tubing, and includes, FIGURE 2, tubing 26 which is formed into a continuous, substantially rectangular configuration approximating that defined by the configuration of the bottom wall of bathtub 14.

In addition to the bottom portion formed by tubing 26, stationary frame 10 also includes a substantially vertically disposed back portion formed by light weight tubing sections 28, FIGURES 1 and 3. Tubing sections 28 are rigidly secured at their forward ends to opposite sides of the rectangular frame formed by tubing 26, and extend diagonally rearwardly and thence inwardly where they are secured at their rearward ends to the upper end of a stationary or fixed cylindrical sleeve 30. The lower end of sleeve 30 is welded to tubing 26.

The back portion of frame 10 also includes a pair of tubing sections or guide elements 32 which are disposed in a substantially vertical direction parallel to sleeve 30. Elements 32 are connected at their upper ends to tubing sections 28 and at their lower ends to tubing 26. In this manner, tubing 26 and tubing sections 28 form an integral and rigid structure which is further braced by rigid interconnection with sleeve 30 and guide elements 32.

Movable frame 16 is substantially similar in construction to stationary frame 10, being made up of light weight tubing such as aluminum. As best seen in FIGURES 2 and 4, movable frame 16 includes a bottom portion

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formed of a length of tubing 34 which extends from the forward end of the hoist rearwardly, from whence tubing 34 is formed upwardly, across to the opposite side of the hoist, and thence downwardly to provide a back portion for frame 16. Tubing 34 is then carried forwardly to the forward end of the hoist, and at this point the ends of tubing 34 are secured together by a short length of tubing 36 to form a box-like configuration open at its rearward side.

The upper portion of tubing 34 which forms the back of frame 16 is welded to a tubing section 38 which extends in a substantially vertical direction for connection to ram 18, as will be seen.

The tubular components of movable frame 16 carry a sheet 40 of rigid material, such as metal or the like, for supporting the user of the present hoist. Sheet 40 extends rearwardly from a point overlying the forward end of movable frame 16, and thence extends upwardly, to a point slightly above the tubing 34 forming the back of frame 16. Sheet 40 is secured to tubing 34 by a plurality of brackets 42 which are rigidly secured to sheet 40 by a plurality of fastening means, such as nut and bolt assemblies 44.

Movable frame 16 rolls upwardly and downwardly on the back portion of stationary frame 10 through the provision of two pairs of rollers 52 which are carried by a pair of guide roller brackets 46. Brackets 46 each includes a pair of elongated support arms 48 which are spaced apart and welded to tubing 34 of frame 16. The rearward portions of support arms 48 extend rearwardly and upwardly and are provided with aligned openings for receiving roller shafts 50 upon which rollers 52 are rotatably carried. Each of the pairs of rollers 52 is arranged so that one of its rollers 52 rests on the forward face of the adjacent guide elements 32 and the other of its rollers 52 is on the rearward face of the elements 32. This can conveniently be done during the assembly of the present hoist by first mounting on brackets 46 the forwardly disposed rollers of the pairs of rollers 52. Thereafter, these mounted rollers are arranged adjacent to the adjacent guide elements 32 with the free ends of brackets 46 projecting rearwardly beyond elements 32. Next, the rearwardly disposed rollers 52 are mounted upon brackets 46, it being noted that the spacing between the rollers 52 on each bracket 46 is arranged such that each of the rollers is in intimate contact with the adjoining surfaces of elements 32. In this manner the pairs of rollers 52 serve to support movable frame 16 while yet enabling frame 16 to be moved upwardly and downwardly through the rolling contact of rollers 52 carried by frame 16 upon guide elements 32 carried by frame 10.

Additional bracing and support for movable frame 16 is provided by an elongated strut 54 which includes a pair of axially aligned and spaced apart rods 56 and 58 secured to brackets 60 and 62 and welded to frames 10 and 16, respectively. A sleeve 64 is slidably disposed over the free ends of rods 56 and 58, and a suitable element or shoulder 66 is welded to rod 58 to limit forward movement of sleeve 64. At the opposite end of strut 54 a spring 68 is slidably disposed over the left end of rod 56, the ends of spring 68 abutting at its ends against sleeve 64 and the connection between rod 56 and stationary frame 10. Spring 68 permits limited, resilient movement of sleeve 64 rearwardly, but spring 68 is made sufficiently stiff that the weight of an average person sitting upon frame 16 will not completely compress it. Thus, spring 68 serves as a form of shock absorber which also transmits loads from frame 16 to frame 10 to permit strut 54 to brace frame 16.

The extensible and retractable character of strut 54 also enables strut 54 to accommodate itself to the change in length which it must experience during the vertical travel of frame 16. That is, as frame 16 moves upwardly and downwardly, the right end of strut 54 must also move in a vertical line with it, and since the left end

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of strut 54 is longitudinally immovable, strut 54 cannot move in a true arc and must therefore adjust its length to permit the desired vertical movement of movable frame 16.

Fluid actuated means for raising and lowering frame 16 are connected between stationary frame 10 and movable frame 16 and, in the present hoist, conventionally takes the form of a hydraulic ram comprising an elongated, vertically movable sleeve 70 which is slidably disposed within the stationary sleeve 30 of stationary frame 10. During its extension upwardly and its retraction downwardly sleeve 70 is provided lateral support by a roller 72 which is rotatably carried by a bracket welded to the upper end portion of stationary sleeve 30.

An elongated piston 74 is slidably carried within the hollow interior of movable sleeve 70, and its lower end is disposed through a central opening in a cylindrical plug 76 which is welded to the lower wall 78 which closes the lower end of sleeve 30. As will be apparent, introduction of hydraulic fluid into the space 80, which is formed by the walls of sleeve 70, the upper end of piston 74, and the upper closed end of sleeve 70 (not shown), exerts a pressure tending to raise sleeve 70. Sleeve 70 is secured at its upper portion to the upper end of tubing section 38 by a clamp 82 which is connected to tubing section 38 by a nut and bolt assembly 84 and to the upper end of sleeve 30 by a nut and bolt assembly 86 which is tightened or loosened by a handle 88. By reason of this interconnection between sleeve 70 and tubing section 38, it will be apparent that the raising or lowering of sleeve 70 will effect a raising and lowering of movable frame 16.

The fluid pump means 20 which is operative to introduce hydraulic fluid into space 80 is a usual and conventional type of hydraulic pump or jack, and preferably is a jack of the type commonly used for raising automobiles. This type of jack has been successfully used in the preferred embodiment of the present hoist, although other forms of conventional pumps may be used instead, if desired. Since the details of the particular hydraulic jack are not important or critical to the present invention, jack 20 will not be described in detail. Most such jacks are very straightforward in design, and include a piston which is reciprocable by a plunger, such as plunger 90, FIGURE 3, to move a jack piston rearwardly past a port which permits hydraulic fluid to enter from a reservoir, and forwardly to pump this fluid into an outlet port in communication with space 80. In addition, jack 20 further includes a relief valve (not shown) which is actuated to drain hydraulic fluid from the output side of the jack piston to permit fluid to drain from space 80 to permit sleeve 70 to move downwardly of its own weight. Such a relief valve is usually associated with an external element, such as element 92 which is pivotable by a wire 94 connected to the end thereof. Wire 94 is conveniently disposed through the hollow interior of arm 22, and is provided with an end button 24 for longitudinal movement of wire 94 to pivot element 92 and thereby operate the relief valve of jack 20.

The present jack 20 is operated by upward and downward pivotal movement of arm 22 about a pivot point 96. Pivotal movement of arm 22 causes a lever arm 98 to reciprocate plunger 90 and operate the jack piston (not shown) of jack 20.

It is noted that the lateral location of arm 22 may be adjusted so that arm 22 lies on either side of the hoist. This is conveniently done by rotating handle 88, FIGURE 5, to loosen nut and bolt assembly 86 sufficiently to permit rotation in a horizontal plane of sleeve 70 and jack 20, and thereafter retightening assembly 86.

In the event that it is desired to use the present hoist with various sizes of tubs 14, movable frame 16 may be made so as to telescope for short tubs, and extend for long tubs. As indicated in FIGURE 2, the telescoping portions of frame 16 meet along a line 100 indicated in

phantom. That is, sheet 40 could be slitted at that point, and the sections of tubing 34 made to telescope at that point. Further, element 66 would not be welded to rod 58, but would be connected with a usual and conventional Allen screw so that its position could be adjusted for optimum operation.

To more securely anchor the sides of stationary frame 10 to the inner surfaces of the walls of tub 14, each diagonal section of tubing 28 is provided with a pair of anchors 102. As best seen in FIGURE 3, each anchor 102 comprises a stud which is threaded through the walls of the section of tubing 28 with which it is associated. One end of the stud has a wing nut 104 secured to one end thereof, and a rubber element 106 is rotatably carried at the other end of the stud. Thus, with frame 10 in position within the tub, wing nuts 104 are turned until elements 106 firmly abut against the inner surfaces of the side walls of tub 14 to thereby anchor frame 10 and constrain it against undesirable lateral movement.

In the operation of the present hoist, arm 22 is pumped upwardly and downwardly to force hydraulic fluid into space 80 to thereby raise sleeve 70. Since sleeve 70 is connected to movable frame 16 by bracket 82, frame 16 is also raised. Rollers 52 and 72 guide frame 16 in its upward movement, and strut 54 pivots upwardly with frame 16, being elongated slightly by reason of the departure of strut 54 from a true arc, as previously described.

When frame 16 has reached the approximate height of the upper edge of the bathtub walls, the user seats himself upon frame 16 with his legs extended and substantially completely supported by frame 16. The weight of the user compresses spring 68 to a certain extent, and thereafter the weight of the user is braced by strut 54. Thus, instead of providing a very rigid and undesirably heavy frame 16 to carry the cantilevered weight of the user, strut 54 provides the required bracing with little added weight. Lateral thrust forces are taken up by rollers 52 bearing against guide elements 32, and roller 72 serves to brace sleeve 70, particularly in this upper or extended position of sleeve 70.

The user then pushes button 24, which moves wire 94 and pivots element 92 to thereby port hydraulic fluid from space 80 into the reservoir of jack 20. The orifice through which the hydraulic fluid escapes is preferably made small enough so that even with the weight of the user upon frame 16, frame 16 moves downwardly gradually. When frame 16 reaches its lowermost position it will be nested within frame 10 to thereby occupy a minimum space.

When it is desired to raise platform 16 to enable the user to get out of the tub, handle 22 is manipulated as previously described.

With the construction above described, it will be seen that a simple and convenient means is provided for invalids to get into and out of bathtubs without the assistance of others. The hoist is comparatively light in weight to permit easy placement in and removal from the tub. The disposition and interconnection of the various components of the hoist afford great strength in spite of their light weight. Further, the hoist is easily operated by manipulation of handle 22 and button 24, and in actual use small children are able to operate the hoist with ease.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will

be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

I claim:

1. In combination, a bathtub; a self-contained, portable hoist for use by invalids and the like, said hoist comprising a stationary frame supported solely by the bathtub and which includes a bottom portion resting upon the bathtub and which includes a substantially vertical portion integrally connected to said bottom portion, said vertical portion including tubular members and a tubular stationary sleeve closed at its lower end and connected with and disposed substantially vertically from said bottom portion; a movable frame which includes a seat portion, rigidly attached to said movable frame, for supporting the weight of the bathtub user, and which includes at least two pairs of rollers rotatably supported by said movable frame, each said pair of rollers being located with one of said tubular members disposed between the rollers of said pair to confine movement of said movable frame in a direction parallel to said guide means; a tubular movable sleeve connected to said movable frame and slidably disposed within said stationary sleeve; a piston disposed within and slidable relative to said movable sleeve, the lower end of said piston resting upon the lower end of said stationary sleeve; means operable for introducing hydraulic fluid under pressure within said movable sleeve above said piston to thereby raise said movable frame; and an elongated arm connected to and hand actuable to operate said last-mentioned means.

2. In combination, a bathtub; a hoist for use by invalids and the like, said hoist comprising a stationary frame which includes a bottom portion resting upon the bathtub and which includes a substantially vertical portion integrally connected to said bottom portion, said vertical portion including guide means connected with and disposed substantially vertically from said bottom portion; a movable frame which includes a seat portion for supporting the weight of the bathtub user, and which includes means cooperating with said guide means to confine movement of said movable frame in a direction parallel to said guide means; an elongated strut means pivotally connected at one end to said stationary frame and diagonally disposed toward and pivotally connected to said movable frame at its other end, said strut means including a rod and a sleeve, said rod having a free end slidably carried within said sleeve, said strut also including a bias means connected between said rod and said sleeve to yieldably limit the extent of relative movement of said rod and said sleeve toward each other; fluid actuated means connected between said stationary frame and said movable frame and extensible and retractable to raise and lower, respectively, said movable frame; and fluid pump means for actuating said fluid actuated means, said fluid pump means including an elongated element manually pivotable by the user to operate said fluid pump means to actuate said fluid actuated means.

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