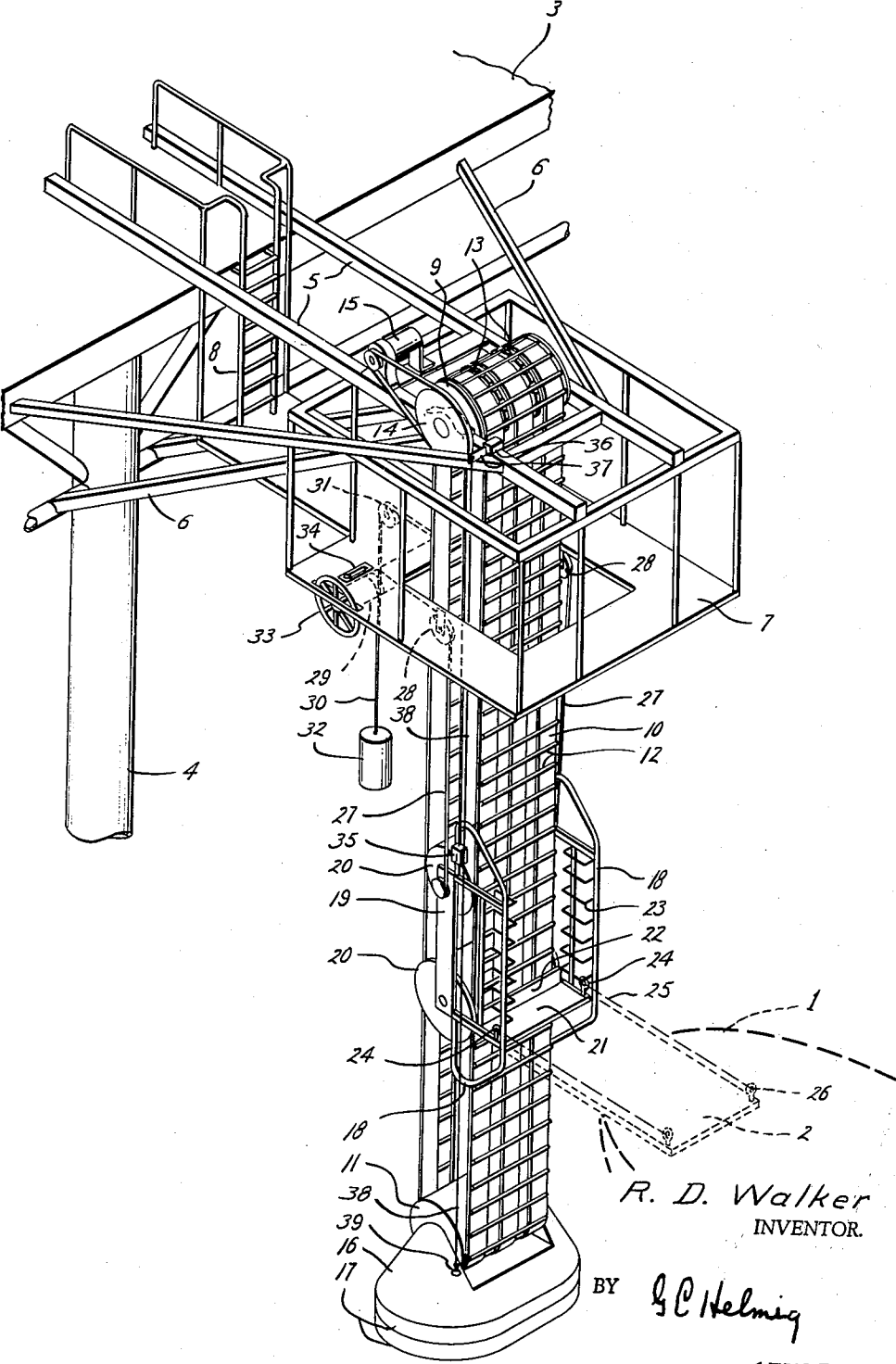


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MARINE LANDING ASSEMBLY  
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1

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## MARINE LANDING ASSEMBLY

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1 Claim. (Cl. 214—14)

This invention relates to landing assemblies and more particularly to equipment by which personnel may be quickly and safely transferred even in heavy seas between marine structures such as an offshore well drilling platform and a crew boat. Offshore drilling structures have been located in waters of various depths and their elevated platforms have been placed considerably above a calm sea surface a distance over the splash from highest swells likely during severe storms and hurricane winds. The problems of personnel transfer to and from a wave buffeted and bobbing crew boat greatly multiply with storm intensity and it is an object of the present invention to effectively meet adverse sea conditions by providing equipment to better safeguard workmen against accident and injury in their passage between terminal landings on a drilling rig and a boat, and especially during violent relative toss and sway of the landings.

More specifically, the invention deals with a circuit traveling endless elongated loop conveyor of pliable belting material vertically suspended at its upper return loop bend from an outrigger projection on the elevated upper level platform of the offshore structure and offset laterally beyond the side thereof and from which the flexible pendent reaches of the conveyor loop extend a distance that the lower return loop bend will reach the deck of a crew boat riding the deepest wave trough likely to occur and which flexible reaches enable free swinging thereof and sideward displacement of the lower return bend from a vertical plane containing the outrigger carried point of suspension as to accommodate a considerable range of wavethrown and windblown boat movement without smashing against the side of the drilling structure whereby persons debarking from or embarking on the boat may easily leave or mount the conveyor and by timely grabbing and releasing the traveling conveyor securely ride between upper and lower landing levels.

A further object of the invention is to provide a free-hanging flexible belt loop entrained at its upper end over a rotary wheel and at its lower end on a weighted roller which maintains proper tension on the belt loop, acts as an inertia stabilizer for cushioning displacement freedom of the lower end of the loop and if desired, is arranged to be submerged for dampening co-operation with the water.

Another object is to provide an endless conveyor belt having circuit travel selectively in either direction for carrying workmen between vertically spaced landing platforms and having one vertical belt reach passaged through an open space in a vertically shiftable landing step unit and located in relation to the unit, between an idler roller interposed between the parallel reaches to bear on the inner face of the belt and a step tread extending across the forward face of the belt reach, the landing step unit being tied to the lower platform and suspended by a variable length cable from the upper platform whereby the landing step unit partakes of and follows the rise and fall of the sea to facilitate safe

2

transfer between the traveling belt and the lower step unit.

Other objects and advantages will become apparent during the course of the following specification having reference to the accompanying drawing of a preferred but not necessarily the only embodiment of the invention and being a perspective view of a vertical hung endless conveyor ladder mounted in outrigger relation to an offshore platform structure.

At the lower right-hand corner of the drawing a fragment of a floating crew boat 1 is indicated by broken lines and its deck may be considered as constituting a lower landing platform but for lateral clearance between the boat hull and the conveyor, the boat deck preferably has an extension platform 2 projected beyond the hull and its far edge can be brought into close relationship beside the vertical path of the conveyor. The platform 2 will have conventional raised hand rails, not shown in the drawing for reasons of simplicity of disclosure. When a transfer is to be effected, the boat will be maneuvered into a position in which its platform 2 is in adjoining grab relation to the ladder belt, which is an assembly with the upper landing platform and is suspended so that its free lower end is sufficiently spaced away from any portion of the superstructure as to minimize the likelihood of contact therewith. With that in mind, there can be mounted on the upper platform and beyond the side thereof leeward of the direction of prevailing and expected storm winds, an outrigger platform having at its outer end, a belt suspending drum or drive wheel. By way of example, the drawing shows a well drilling platform or superstructure 3 supported in the air either on a floating barge or by a group of upstanding columns or posts, such as shown at 4, which rest on the sea bottom or are parts of a submerged barge. Secured to and projected beyond the side margin of the platform 3 are a pair of outrigger beams 5—5 suitably braced at their outer ends from the platform by diagonal bars 6—6. A walkway or landing platform 7 is suspended from the outrigger beams 5—5 at a distance somewhat greater than a man's height and is accessible with the main work platform 3 by a side ladder 8. For reasons of safety, the side of the walkway 7 will in practice be closed in by railings or walls such as metal meshwork.

Mounted overhead of the walkway 7 on a transverse horizontal axis and conveniently mounted in journal bearings carried by the outrigger rails 5—5 is a rotatable wheel or drum 9. Entrained on the overhead drum is the upper return bend of a vertically suspended conveyor 10 in the form of an endless elongated loop which hangs down through a central manhole in the walkway floor and whose lower return bend cradles or receives an idler roller 11. As shown in the drawing, the endless conveyor is of a relatively soft surfaced and pliable or flexible material which has high tensional strength but is readily yieldable or bendable in directions angular to its longitudinal extent. Rubberized fabric is an example of material suitable for providing such conveyor and it can be a single belt with a longitudinal succession of central openings or, as shown, in the form of two or more similar transversely spaced apart bands whose outer faces are crossed by and bolted or otherwise secured to a succession of longitudinally spaced transversely extending bars or ladder rungs 12. These bars 12, equally spaced throughout the loop length, integrate the spaced conveyor bands into a unit assembly, and also provide handgrabs and footrests in their regions which bridge the intervening spaces between adjoining bands. Additionally, they intermesh with mating peripheral formations on the drive wheel 9, such mating formations being preferably afforded by a pair of transversely spaced toothed sprockets 13, for insuring a positive drive or antislip

relation between the depending conveyor belt and the upper drum 9.

A power transmitting connection for the drum 9 is provided by a pulley or gear wheel 14 on the drum shaft for connection by a belt or chain with an electric reversible motor and brake unit 15 fixed on the outrigger platform. This drive motor and brake unit 15 is of a well known conventional type and incorporates mechanism to hold the motor shaft stationary but which mechanism is electrically responsive to free the shaft at times when current is supplied to effect shaft rotation in either direction. When the motor is not supplied with current the conveyor and its drive wheel are braked against circuit travel and when the motor receives operating current the conveyor is driven in either of opposite directions for carrying personnel upward or downward on the conveyor. In place of braking mechanism, there can be used an irreversible worm gear drive to resist drum rotation by load from the conveyor.

To insure tautness in the endless loop, the bottom idler roller 11 has depending from its axle, a weight hanger stirrup 16, to the underside of which may be hung any suitable number of weight adding plates 17 for the application of a predetermined downward load on the conveyor belt. The length of the belt depending from the superstructure will be such as to position the lower roller 11 below the boat deck, and as a rule above the normal surface of the sea. For some purposes the bottom of the belt and weighted roller 11 may be submerged or, optionally, the weighted mass may be suspended from the hanger 16 by a long flexible bridle whereby to remain submerged and preferably at sufficient distance below the boat bottom as to stay out of damaging contact with the boat. Submergence, at least of the weights, will co-operate with the surrounding water for a resistance to changes in position, but whether or not any part of the weight is submerged, the weight serves as an inertia stabilizer and a yielding anchor bob for the free hanging loop.

To facilitate transfer between the crew boat and the conveyor belt, it is proposed to provide a landing step subassembly unit for alignment with the landing platform of the boat when the latter is adjacent the circuit travel path of the active reach of the conveyor belt or ladder. Such subassembly forms a part of and is suspended by a variable length cable from the upper landing platform. The stepped unit includes opposite side frames, each having a forwardly projecting and upstanding safety fender or grabrail 18 and a rearwardly vertically extending stanchion or post 19. At opposite vertically spaced ends of the two side posts 19 there are journaled idler rolls 20—20 which operate in the vertical space between the vertical reaches of the conveyor belt. Either one or both may have enlarged rims or end disks for guiding reception with the side edges of the belt reaches. Spaced forwardly from the lowermost idler roll 20 a short distance to provide for close passage beside and circuit travel of the foremost belt reach is a horizontal step tread 21 whose opposite ends are secured near the bottoms of the hand rails 18. A vertical guard or riser 22 at the back edge of the tread 21 prevents a person's foot on the step tread being accidentally projected against the conveyor belt. Vertically spaced and horizontally positioned grabrails 23 are carried by the handrails 18 above the step 21 and provide ladder hand holds and footrests for such assistance as a workman can take advantage of in transferring between the conveyor and the step tread. At each side of the landing step unit, and preferably in horizontal alignment with the axis of the lower idler roll 20, are a pair of eyes 24 and a tie cord 25 is shown as extending from each eye at the level of the landing platform 2 for connection to an anchorage member 26 on the crew boat 1, whereby the landing step assembly and the landing platform 2 can be maintained in operative relation to one another and to the conveyor belt on

which the idler 20 bears as a belt path positioning member. It will be understood that the tie connection will not be required for all conditions of use.

The variable length suspension for the landing step unit is shown in the drawing as comprising two transversely spaced flexible cables 27, each suspended by a pulley 28 on the underside of the walkway 7 with one cable end fastened to the frame post 19 and the other cable end wrapped around a winch or rotary drum 29 mounted beneath the walkway 7. Another cable 30 has one end wrapped around the drum 29 and has its other end suspended from a pulley 31 and connected to a counterweight 32 which may approximate the weight of the landing unit for stabilizing its position but accommodating its movement as a unit with the crew boat toward and from the upper landing platform 7. Power may be applied to the winch 29 for raising or lowering the step assembly before or after connection with the crew boat, and for that purpose a hand wheel 33 is fixed to the winching drum 29 and extends upwardly through an opening in the walkway 7 for manual access. When the mechanism is not in active use the landing step unit may be locked in any position, such as one raised immediately below the walkway, by braking the drum 29. Conveniently this can be accomplished by shifting between the spokes of the wheel 33 an adjustable slider bar 34 and then tightening a fastener to hold the bar securely to the walkway 7.

Electric switches for controlling the supply of current to the motor 15 are provided at convenient locations, one switch 35 being shown as carried on the shiftable step assembly unit and a switch 36 being shown carried on the overhead outrigger mechanism in convenient reach of anyone standing on the walkway 7. Thus belt transfer can be controlled from either position. In addition, the switch 36 has a rocker arm 37 which will respond to a downward pull to stop the supply of current to the motor. Fastened to the free end of the lever 37 is a dependent cable 38 which runs in parallelism along the side of the conveyor and within easy reach of anyone riding the belt between landing levels and usable in the event for any reason he desires to stop the travel. This control cable may conveniently pass through guide eyes on one of the framing rails 18 and have its lower end connected at 39 to the lower roll supported hanger 16.

In the usual use of the mechanism, as, for example, at a time when working crews are to be changed, a work boat carrying the fresh crew will come beside the dependent conveyor loop and tie on by means of the cables 25. The motor 15 will be driven for imparting circuit travel to the conveyor, which raises the reach passing between the step 21 and the belt positioning idler rollers 20, and one by one the crew will transfer in succession, each grabbing the most convenient rung on the belt, riding up to the walkway 7 and there leaving the belt and walking onto the main platform 3. The crew debarking from the upper landing platform will then reverse the direction of belt travel and each man in succession will move from the platform 7 and ride down to the lower level. During that time the crew boat may shift its position due to wave action, but the lower landing platform 2 and the shiftable landing step 21 will tend to remain in substantial alignment since the counterbalanced step 21 can change its vertical position relative to the belt and the flexibility in the belt will accommodate a reasonable range of horizontal displacement from the vertical plane through the suspension drum 9. Wide relative movement will necessitate more care on the part of a person making a transfer between the step 21 and the traveling conveyor belt, and if the wave action is fairly high the transfer will best be made close to the top of a wave crest rather than while the boat is near the bottom of a wave trough, and this particularly is the case if the rise of the boat exceeds

5

lift of the conveyor belt when a man is debarking from the boat. Similarly, when a man is riding down on the belt, he should time his transfer onto the step when the differential rate of movement is not too great. The series of side rungs 23 supplements the step tread 21 for giving a vertical range for effective transfer. Some practice and agility will be helpful but no unusual skill will be required. A man riding down the belt and as he approaches the landing step often will be hanging by one foot and one hand, keeping the other foot and hand free to swing quickly and make a transfer to the step and then walk forward onto the crew boat deck. In rough water he can ride the conveyor down to within a short distance above the rise of the side fenders 18 of the step unit and there stop belt travel through the motor cutoff rope 38 which has been sliding through his hand. This enables control of belt travel to suit individual timing and judgment. Then he can prepare to climb down the belt ladder rungs and swing off, either to the step tread 21 or the side fender rungs 23, as he chooses.

With the flexible belt hanging away from the superstructure, the dependent portion can bend or swing and smoothly follow crew boat motion and there is little likelihood of forcible contact with the superstructure in a manner that might cause shock or distraction or cause a man to lose his hold or be crushed, and therefore injury to personnel and damage to the equipment are minimized.

In compliance with the statute, the foregoing description has been limited to the precise structure illustrated in the drawing but it is to be understood that this is not by way of limitation and various modifications in the illustrated embodiment may readily be made as come within the scope of the following claim.

What is claimed is:

Mechanism especially adapted for the transfer of personnel between different level platforms on different marine structures at least one of which is subject to rise and fall with water level change and comprised of an end-

6

less flexible belt having return bends vertically spaced apart, ladder rungs extended transversely of and secured to the outer face of said flexible endless belt, an upper level platform for securement in outrigger relation to a supporting transfer structure, a rotary wheel mounted on the platform above the floor thereof for entrainment of the upper return bend on said wheel and from which the flexible belt is pendently suspended in laterally spaced relation with such supporting structure, intermeshing drive surfaces on the belt and said wheel, means to impart rotation to said wheel for thereby driving said belt, a weighted idler wheel around which the lower return bend of said flexible belt is entrained for holding the belt under tension, variable length suspension means carried by said platform and dependent therefrom in parallelism with said belt, a landing unit hung by said suspension means for vertical travel toward and from said platform and comprised of a landing step positioned forwardly of the outer face of one reach of the belt and a bearing member projected behind the inner face of said reach, means tying said unit with another transfer structure at a height below said platform and arranged to hold said belt reach adjacent the last mentioned transfer structure and to partake of the rise and fall thereof upon relative change in levels of said transfer structure.

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