

tubulars that must be handled manually. By eliminating unnecessary motions in the process from storage to delivery, the logistical flow improvement translates directly to improved reliability and consistent tripping efficiency.

[0005] Embodiments of this invention may simplify the processes of transporting and assembling tubulars by eliminating wasted movements. For example, pipe racking system (“PRS”) travel time is reduced going from the well center to a setback slot and back again as embodiments of the invention presents tubulars to the well center directly with no wait time. Further, the manual handling of tubulars is dangerous and can be inconsistent. Embodiments of this invention may significantly minimize human interface with moving tubulars and is a major step toward total automation of tubular handling.

BRIEF SUMMARY OF THE INVENTION

[0006] According to a first aspect of the present invention, there is provided an apparatus comprising a tubular standbuilding conveyor apparatus that includes a horizontal conveyor ~~belt apparatus running~~ extending along a horizontal axis; a first vertical conveyor belt apparatus oriented parallel to and vertically offset from the horizontal conveyor belt apparatus; and a second vertical conveyor oriented parallel to and vertically offset from the first vertical conveyor; a stand building hoist; and an iron roughneck. The ~~horizontal and vertical tubular standbuilding conveyor belts apparatus are~~ is configured to convey at least two attached vertically vertically-oriented tubulars along the horizontal axis and the stand building hoist and the iron roughneck are configured to attach a vertically vertically-oriented tubular to one or more other vertically vertically-oriented tubulars.

[0007] The horizontal conveyor belt apparatus is capable of supporting large point loads and includes a steel track shoe belt. The surface of the horizontal conveyor belt apparatus is covered with a protective surface. The protective surface is at least one of wood, nylon or rubber.

[0008] The vertical conveyor belt apparatus includes a cogged belt, which is mechanically coupled to the vertical conveyor belt apparatus through a set of right angle drive gears. At least one additional vertical conveyor belt apparatus is located parallel to and vertically offset from the vertical conveyor belt. In one embodiment, there exists at least one additional vertical conveyor belt apparatus. The vertical conveyor belt apparatuses are offset from each other on the horizontal ends of the vertical conveyor belts. The parallel vertical conveyor belt apparatuses are horizontally offset from each other. The vertical conveyor belts are horizontally offset from each other such that when a vertical tubular is on the horizontal conveyor apparatus and leaned against the vertical conveyor belt apparatus, the vertical

tubular would be at about a 3 degree angle from a plane running vertically through the horizontal center of the horizontal conveyor apparatus.

[0009] The apparatus further includes a stand delivery conveyor assembly configured to convey vertically oriented tubulars to or from the horizontal conveyor belt apparatus. The stand delivery conveyor assembly includes a delivery horizontal conveyor belt apparatus running along the horizontal axis; and at least one delivery vertical conveyor belt apparatus oriented parallel to and vertically offset from the horizontal conveyor belt apparatus. At least one additional vertical conveyor belt apparatus is located parallel to and vertically offset from the vertical conveyor belt.

[0010] There is further disclosed a tubular interchange device located between the tubular standbuilding conveyor apparatus and the stand delivery conveyor assembly, wherein the tubular interchange device is configured to convey vertically oriented tubulars from the horizontal conveyor belt apparatus to the stand delivery conveyor assembly.

[0011] According to a second aspect of the present invention, there is provided a ~~drill rig including an apparatus located on a drill floor comprising: a first and second~~ tubular standbuilding conveyor apparatuses, each comprising a horizontal conveyor belt apparatus running extending along a horizontal axis; and a vertical conveyor belt apparatus oriented parallel to and vertically offset from the horizontal conveyor belt; a stand building hoist; and an iron roughneck; wherein the horizontal and vertical first and second tubular standbuilding conveyor belts apparatuses are each configured to at least two attached convey vertically-vertically-oriented tubulars along the horizontal axis; and wherein the stand building hoist and the iron roughneck are configured to attach a vertically-vertically-oriented tubular to one or more other vertically-vertically-oriented tubulars.

[0011a] The drill rig includes a vertical tubular setback area located forward of the tubular standbuilding conveyor apparatus and a vertical assembled tubular setback area located aft of the tubular standbuilding conveyor apparatus and in proximity to the well center. A lower level bridge crane assembly is also included in which the lower level bridge crane assembly is configured to move a tubular from the setback area to the tubular standbuilding conveyor apparatus. An upper level bridge crane assembly is further included. The stand building hoist is attached to the upper level bridge crane assembly. The iron

roughneck may also be attached to the upper level bridge crane assembly. An additional tubular standbuilding apparatus is included in which each tubular standbuilding apparatus is oriented such that the horizontal conveyor belt apparatus is inboard of the vertical conveyor belt apparatus. Though this embodiment is directed toward a moveable drill floor, a person skilled in the art would recognize that the design is equally applicable to a fixed drill floor.

[0012] According to a third aspect of the present invention, there is provided a method for ~~providing tubular assembly~~assembling tubulars, the method comprising the steps of ~~loading-disposing~~ at least a first and a second ~~vertically-vertically-oriented~~ tubulars onto a horizontal conveyor of a conveyor ~~assembly~~apparatus comprising a first vertical conveyor oriented parallel to and vertically offset from the horizontal conveyor; and a second vertical conveyor oriented parallel to and vertically offset from the first vertical conveyor;; raising the first vertically-oriented tubular above the second vertically-oriented tubular; ~~and-attaching~~ the first vertically-oriented tubular to the second vertically-oriented tubular and conveying the attached first and second vertically-oriented tubulars along the conveyor apparatus.

[0012a] The step of raising the first tubular is done with a standbuilding hoist. Attaching the first tubular

to the second tubular is done with an iron roughneck.

[0012b] According to a fourth aspect of the present invention, there is provided a method for ~~providing-disassembling tubulars, the method disassembly comprising: the steps of~~ removing at least two attached tubulars from a well center; ~~loading-disposing the at least two~~ attached tubulars onto a ~~vertical-conveyor assembly~~ apparatus comprising: a horizontal conveyor; a first vertical conveyor oriented parallel to and vertically offset from the horizontal conveyor; and a second vertical conveyor oriented parallel to and vertically offset from the first vertical conveyor; ~~separating an uppermost tubular of the at least two attached tubulars from one or more~~ others of the least two attached tubulars; and lowering the ~~top-most separated-uppermost~~ tubular onto the ~~vertical-conveyor assembly~~ apparatus.

[0012c] A further step is conveying the separated tubulars to a storage setback using the vertical conveyor assembly in which separating the attached tubular is done with an iron roughneck and the lowering is done with a standbuilding hoist.

[0013] The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter which form the subject of the claims of the invention. It should be appreciated by those skilled in the art that the conception and specific embodiment disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims. The novel features which are believed to be characteristic of the invention, both as to its organization and method of operation, together with further objects and advantages will be better understood from the following description when considered in connection with the accompanying figures. It is to be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended as a definition of the limits of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] For a more complete understanding of the present invention, reference is now made to the following descriptions taken in conjunction with the accompanying drawing, in which:

[0015] FIG. 1 is a profile view of a rig illustrating an embodiment of pipe storage and setback.

[0016] FIG. 2 is a profile view of a rig illustrating an embodiment of the pipe handling equipment.

CLAIMS

What is claimed is:

1. An apparatus comprising:

a tubular standbuilding conveyor apparatus, comprising:

a horizontal conveyor ~~belt apparatus running~~extending along a horizontal axis;

a first vertical conveyor ~~belt apparatus oriented~~ parallel to and vertically offset

from the horizontal conveyor ~~belt~~; and

a second vertical conveyor oriented parallel to and vertically offset from the

first vertical conveyor;

a stand building hoist; and

an iron roughneck;

wherein the ~~horizontal and vertical~~tubular standbuilding conveyor belts

apparatus are is configured to convey at least two attached vertically

vertically-oriented tubulars along the horizontal axis; and

wherein the stand building hoist and the iron roughneck are configured to attach

a ~~vertically~~vertically-oriented tubular to one or more other ~~vertically~~

vertically-oriented tubulars.

~~2. The apparatus of claim 1, wherein the horizontal conveyor belt apparatus is capable of supporting large point loads.~~

~~32. The apparatus of claim 1, wherein the horizontal conveyor belt apparatus comprises a steel track shoe belt.~~

~~43. The apparatus of claim 1, wherein the surface of the horizontal conveyor belt apparatus is covered with~~comprises a belt having a protective surface~~outer covering.~~

~~54. The apparatus of claim 43, wherein the protective surface~~outer covering comprises is at least one material selected from the group consisting of wood, nylon and rubber.

~~65. The apparatus of claim 1, wherein at least one of the first and second vertical conveyors~~belt apparatus comprises a cogged belt.

- ~~7. The apparatus of claim 6, wherein the cogged belt is mechanically coupled to the vertical conveyor belt apparatus.~~
- ~~8. The apparatus of claim 7, wherein the mechanical coupling is through a set of right angle drive gears.~~
- ~~9. The apparatus of claim 1, further comprising at least one additional vertical conveyor belt apparatus located parallel to and vertically offset from the vertical conveyor belt.~~
- ~~106. The apparatus of claim 91, comprising wherein the tubular standbuilding conveyor apparatus comprises at least one additional a third vertical conveyor belt apparatus oriented parallel to and vertically offset from the horizontal conveyor.~~
- ~~11. The apparatus of claim 9, wherein the vertical conveyor belt apparatuses are offset from each other on the horizontal ends of the vertical conveyor belts.~~
- ~~127. The apparatus of claim 91, wherein the parallel first and second vertical conveyors belt apparatuses are horizontally offset from each other such that, when a vertically-oriented tubular is disposed on the horizontal conveyor and is leaned against the first and second vertical conveyors, the vertically-oriented tubular is disposed at an angle relative to a plane extending vertically from the horizontal axis.~~
- ~~138. The apparatus of claim 127, wherein the vertical conveyor belts are horizontally offset from each other such that when a vertical tubular is on the horizontal conveyor apparatus and leaned against the vertical conveyor belt apparatus, the vertical tubular would be at the angle is about a 3 degrees angle from a plane running vertically through the horizontal center of the horizontal conveyor apparatus.~~

~~149.~~ The apparatus of claim 1, further comprising a stand delivery conveyor ~~assembly apparatus~~ configured to convey one or more ~~vertically-vertically-~~ oriented tubulars ~~to toward or away from the horizontal tubular standbuilding conveyor belt apparatus.~~

~~1510.~~ The apparatus of claim ~~149~~, wherein the stand delivery conveyor ~~assembly apparatus~~ comprises:

a delivery horizontal conveyor ~~belt apparatus running~~ extending along the horizontal axis; and

one or more delivery vertical conveyors, ~~belt apparatuses~~ each oriented

parallel to and vertically offset from the delivery horizontal conveyor belt.

~~1611~~. The apparatus of claim ~~1510~~, further comprising at least one additional wherein the one or more delivery vertical conveyors belt apparatus located ~~parallel to and vertically offset from the~~ comprises two or more delivery vertical conveyors belt.

~~1712~~. The apparatus of claim ~~149~~, further comprising a tubular interchange device located between the tubular standbuilding conveyor apparatus and the stand delivery conveyor ~~assembly apparatus~~, wherein the tubular interchange device is configured to ~~convey transfer one or more vertically vertically-oriented tubulars~~ from the tubular standbuilding conveyor apparatus to the stand delivery conveyor ~~assembly apparatus~~.

~~1813~~. A drill rig including an ~~An~~ apparatus located on a drill floor comprising: a first and second tubular standbuilding conveyor apparatuses, each comprising:

a horizontal conveyor ~~belt apparatus running~~ extending along a horizontal axis; and

a vertical conveyor ~~belt apparatus~~ oriented parallel to and vertically offset from the horizontal conveyor ~~belt~~;

a stand building hoist; and

an iron roughneck;

wherein the ~~horizontal and vertical~~ first and second tubular standbuilding conveyor belts apparatuses are each configured to convey at least two attached ~~vertically vertically-oriented~~ tubulars along the horizontal axis; and

wherein the stand building hoist and the iron roughneck are configured to attach a ~~vertically vertically-oriented~~ tubular to one or more other ~~vertically vertically-oriented~~ tubulars.

~~19~~14. The ~~drill-rig~~apparatus of claim ~~18~~13 wherein the apparatus is disposed on a
drill floor ~~is moveable~~of a drill rig.

~~20~~15. The ~~drill-rig~~apparatus of claim ~~18~~14, further comprising a forward vertical
tubular setback area located forward of the tubular standbuilding conveyor
apparatus.

- ~~2216.~~ The ~~drill-rig~~apparatus of claim ~~1814~~, further comprising ~~a~~an ~~aft~~ vertical ~~assembled~~ tubular setback area located aft of the tubular standbuilding conveyor apparatus.
- ~~2217.~~ The ~~drill-rig~~apparatus of claim ~~2015~~, further comprising a ~~lower level~~first bridge crane assembly.
- ~~2218.~~ The ~~drill-rig~~apparatus of claim ~~2217~~, wherein the ~~lower level~~first bridge crane assembly is configured to move a tubular from the ~~forward~~ vertical ~~tubular~~ setback area and to the tubular standbuilding conveyor apparatus.
- ~~2219.~~ The ~~drill-rig~~apparatus of claim ~~1814~~, further comprising ~~an upper level~~a second bridge crane assembly.
- ~~2220.~~ The ~~drill-rig~~apparatus of claim ~~2419~~, wherein the stand building hoist is attached to the ~~upper level~~second bridge crane assembly.
- ~~2221.~~ The ~~drill-rig~~apparatus of claim ~~2419~~, wherein the iron roughneck is attached to the ~~upper level~~second bridge crane assembly.
- ~~27.~~ The drill rig of claim 18, further comprising ~~an additional tubular standbuilding apparatus.~~
- ~~2822.~~ The ~~drill-rig~~apparatus of claim ~~2714~~, wherein each tubular standbuilding conveyor apparatus is oriented such that the horizontal conveyor ~~belt~~ apparatus is inboard of ~~each~~ the vertical conveyor ~~belt~~ apparatus.
- ~~2923.~~ A method for ~~providing tubular assembly~~assembling tubulars, the method comprising:
~~loading-disposing~~ at least a first and a second ~~vertically~~vertically-oriented tubulars onto a horizontal conveyor of a conveyor assembly~~apparatus comprising:~~
 a first vertical conveyor oriented parallel to and vertically offset from the horizontal conveyor; and
 a second vertical conveyor oriented parallel to and vertically offset from the first vertical conveyor;
raising the first vertically-oriented tubular above the second vertically-oriented tubular; and

attaching the first vertically-oriented tubular to the second vertically-oriented
tubular; and
conveying the attached first and second vertically-oriented tubulars along the
conveyor apparatus.

3024. The method of claim 2923, wherein the raising the first tubular is done with
performed using a stand building hoist.

3125. The method of claim 2923, wherein the attaching the first tubular to the
second tubular is done with performed using an iron roughneck.

~~3226. A method for providing disassembling tubulars, the method disassembly comprising the steps of:~~

removing at least two attached tubulars from a well center;

~~loading disposing the at least two attached tubulars onto a vertical conveyor assembly; apparatus comprising:~~

~~a horizontal conveyor; a first vertical conveyor oriented parallel to and vertically offset from the horizontal conveyor; and~~

~~a second vertical conveyor oriented parallel to and vertically offset from the first vertical conveyor;~~

~~separating an uppermost tubular of the at least two attached tubulars from one or more others of the at least two attached tubulars; and~~

~~lowering the top most separated uppermost tubular onto the vertical conveyor assembly apparatus.~~

~~3327 The method of claim 3226, further comprising the step of conveying the separated tubulars to a storage setback using the vertical conveyor assembly apparatus.~~

~~3428. The method of claim 3226, wherein the step of separating the attached tubular is done with performed using an iron roughneck.~~

~~3529. The method of claim 3226, wherein the step of lowering is done with performed using a stand building hoist.~~