

## TOOL GUIDE DEVICE FOR A DRILL FLOOR

There is described a device for vertical tool guiding for a drill floor, more particularly in that there at the drill floor is arranged at least one rig, as the rig/rigs are each  
5 arranged on a rig foundation supported on the drill floor rotatably about a first, vertical axis and arranged to be able to displace a tool in a horizontal working sector which in a vertical projection at least touches or cuts through the central axis in a through rig floor opening, and each rig is  
10 provided with a vertical tool guide track.

During work in wells for exploitation of hydrocarbons from a surface installation there is often the need to alternate between several different remedies arranged on or above a drill floor. Particularly concerning tools to carry out vertical  
15 movements along or close to the well or its casing central axis is there a need for precise vertical movement of the tool and fast displacement away from and in toward said central axis. An example of this is work taking place during building or dismantling of a drill string.

20 Equipment used during such operations is often hung from lifting works in a derrick or corresponding installations rising above the drill floor. Horizontal translation normally takes place by the hanging equipment being pulled away from the derrick centre, or that the lifting works are displaced,  
25 such as on a bridge crane. Load hanging in wires in a lifting

works means a risk both to personnel being on the drill floor, and there is always a possibility for a hanging load to swing due to swaying of the derrick, wind influence or the like.

- 5 The object of the invention is to remedy or reduce at least one of the disadvantages of the prior art.

The object is achieved by the features disclosed in the below description and in the subsequent claims.

The invention provides a device for vertical tool guiding for  
10 a drill floor where one or more rigs each provided with vertical tool guide tracks such as sliding guides with hydraulic cylinder, screw or toothed rack feeding, rising up from its own foundation arranged on the drill floor, as each foundation is rotatable about a vertical axis. The tool-guiding  
15 track is arranged at a distance from the foundation rotation axis. The distances of the rotational axes and tool guiding track from the respective rotation axis is arranged such that a vertical projection of the horizontal movement sector of each tool at least touches a point on the drill floor, for  
20 example represented by the centre of a through opening in the drill floor. Each tool may thereby be displaced in the horizontal direction to individual or cooperating grip on a pipe string extending vertically through said drill floor opening, for example in the form of a drill string or a casing string  
25 connected with a well. Due to the rotatable supporting of the rigs on the drill floor the tools may be swung away from said rig floor central axis for vertical displacement past another tool gripping the pipe string for a new grip above or below the other tool. In one embodiment the tool may also be displaced  
30 radially relative to the rig vertical rotational axis. In another embodiment the rig may be rotated about a second

vertical axis arranged in a distance from the rig foundation rotation axis.

More specifically the invention relates to a device of a vertical tool guide for a drill floor, characterised in that  
5 there on the drill floor is arranged at least one rig, as each rig is arranged on a rig foundation supported on the drill floor and rotatable about a first, vertical axis and arranged to be able to displace a tool in a horizontal working sector which in a vertical projection at least touches or  
10 cuts through the central axis in a through drill floor opening, and where each rig is provided with a vertical tool guide track.

On the drill floor there may be arranged at least two rigs, as the horizontal working sector for the tools of each rig at  
15 least partly overlaps in a vertical projection or touches the vertical projection of the working sector of the other rig(s). All the tools may thereby independently of each other carry out work on such as a pipe string extending downward in or in the direction of a subterranean well, bore hole or the  
20 like.

The tools may be arranged to be able to be moved radially relative to the rotation axis of the rig foundation. The tools thereby have several degrees of freedom and may carry out a wider scope of types of work both outside the central  
25 axis of the through drill floor opening and perpendicular to this.

The rig may be arranged on the rig foundation rotatable about a second vertical axis. Thereby is achieved greater flexibility in the manoeuvring of the tools.

30 The tools may be from the group comprising rotating tools, striking tools, holding tools and fluid pressure generating

tools. The invention may thereby be used for a long series of working operation combinations.

In the following is described an example of a preferred embodiment illustrated in the accompanying drawings, wherein:

- 5 Fig. 1 shows perspectively a principle sketch of a first embodiment comprising two rotatable rigs arranged around a drill floor opening;
- Fig. 2 shows perspectively a principle sketch of a second embodiment comprising three rotatable rigs arranged  
10 around a drill floor opening; and
- Fig. 3 shows a plan view of the embodiment according to figure 2, wherein the working sectors of the tools are indicated.

In the figures the reference numeral 1 indicates a drill  
15 floor where is arranged a first and a second rig 2a, 2b (see Fig. 1), alternatively a first, a second and a third rig 2a, 2b', 2c (see figs. 2 and 3).

The drill floor 1 is in a manner known *per se* provided with at least one drill floor opening 11 arranged for conveying  
20 pipes and tools through, for example to carry out work in a bore hole on a hydrocarbon field. The drill floor opening 11 has a central axis C.

The rigs 2a, 2b, 2b', 2c are each arranged on a rig foundation 21 formed as a turntable 211. The turntable 211 is ro-  
25 tatable about a first, vertical axis A and is provided with a first turning actuator 212 arranged to be able to turn the turntable at least in a sector  $S_a$ ,  $S_b$ ,  $S_c$ , respectively, see figure 3.

The first and second rigs 2a, 2b according to figure 1 and the first and third rig 2a, 2c according to figure 2 are arranged rigidly connected to the turntable 211.

Alternatively the second rig 2b' according to figure 2 is arranged on the turntable about a second vertical axis B. The rotation of the rig 2b' is provided by a second turning actuator 26, as it is arranged to be able to rotate the rig 2b' at least in a sector  $S_b$  (see figure 3).

The rigs 2a, 2b, 2b', 2c are provided with a tool guiding track 22 arranged to receive a tool 24a, 24b, 24c respectively. The tools 24a, 24b, 24c are arranged to be able to be displaced in the longitudinal direction of the tool guiding track 22 for vertical relocation of the tools 24a, 24b, 24c relative to the drill floor 1. Each tool 24a, 24b, 24c is connected to a vertical actuator 23 arranged to relocate the tools 24a, 24b, 24c along the tool guiding track 22 and also to hold the tools 24a, 24b, 24c in a specified position.

The third tool 24c (see figure 2) is provided with a horizontal actuator 25 arranged to be able to displace the tool 24c in a horizontal direction relative to the rig, as in the tool 24c is integrated horizontal guide tracks 27.

When work operations are carried out wherein two or more tools 24a, 24b, 24c cooperate, such as in assembling or disassembling a pipe string, one of the tools 24a, 24b, 24c is to be led past one or both of the other two tools 24a, 24b, 24c for a new operation on another portion of said pipe string. The operation of the active tools 24a, 24b, 24c is thereby maintained, and there is provided a high degree of precision and stability for all the tools 24a, 24b, 24c in all positions on their respective rigs 2a, 2b, 2b', 2c. The device according to the invention is particularly actively

advantageous when operations shall or should be carried out continuously, such as in assembling or disassembling long pipe strings, for example marine risers connecting a surface installation to a well in deep water, and drill strings used  
5 in deep water wells or in horizontal wells.

## C l a i m s

1. A device for vertical tool guiding for a drill floor (1), wherein on the drill floor (1) is arranged at least one rig (2a, 2b, 2b', 2c), the rig (2a, 2b, 2b', 2c) rising up from a rig foundation (21) supported on the drill floor (1) rotatably about a first, vertical axis (A), the rig (2a, 2b, 2b', 2c) being provided with a vertical tool guiding track (22) arranged at a distance from the first, vertical axis (A), the rotation of the rig (2a, 2b, 2b', 2c) about the vertical axis (A) providing a horizontal working sector (S<sub>a</sub>, S<sub>b</sub>, S<sub>c</sub>) of a tool (24a, 24b, 24c), a vertical projection of said working sector (S<sub>a</sub>, S<sub>b</sub>, S<sub>c</sub>) at least touching or cutting through the central axis (C) in a through drill floor opening (11), characterised in that the rig (2b') is arranged on the rig foundation (21) rotatable about a second vertical axis (B).
2. A device according to claim 1, characterised in that there on the drill floor (1) is arranged at least two rigs (2a, 2b, 2c), as the horizontal working sector (S<sub>a</sub>, S<sub>b</sub>, S<sub>c</sub>) for the tool (24a, 24b, 24c) of each rig (2a, 2b, 2c) in a vertical projection at least partly overlaps or touches the vertical projection of the working sector (S<sub>a</sub>, S<sub>b</sub>, S<sub>c</sub>) of the other tool(s) (24b, 24c; 24a, 24c; 24a, 24b).
3. A device according to claim 1, characterised in that the tools (24a, 24b, 24c) are arranged to be able to be moved radially relative to the rotation axis of the rig foundation (21).

4. A device according to claim 1,  
c h a r a c t e r i s e d i n that the tools (24a,  
24b, 24c) are from a group comprising rotating tools,  
striking tools, holding tools and fluid pressure  
5 generating tools.