Abstract: The invention relates to a drilling rig, comprising a mast to be placed above or close to a well and means connected to the mast for carrying drill pipes to be lowered into the well, which carrying means comprise at least three carriers which are connected at different heights to the mast and displaceable in height direction therealong and which are adapted to exert a pulling force or a pressing force as required on the drill pipes. The upper carrier can have means for rotatingly driving the drill pipes, while the lower carrier, which can be connected releasably to the mast, can have flexible means for connecting thereof to a blowout preventer placed on the well. The invention further relates to a method for introducing one or more drill pipes into an underbalanced well while making use of such a drilling rig, comprising of suspending the drill pipe(s) from the carrying means and urging the pipe(s) downward into the well while exerting a pressing force.
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
The invention relates to a drilling rig, comprising a mast to be placed above or close to a well and means connected to the mast for carrying drill pipes to be lowered into the well. Such a drilling rig is generally known and is used to form wells at locations where oil or gas is present in the ground.

The most characteristic component of the known drilling rig is the mast or derrick construction, generally a slender framework pyramid which is placed above the drilling location or erected thereon and which rests on a foundation adjacent to or around the drilling location. Arranged at the top of this mast is a hoisting gear with which drill pipes can be successively picked up from the ground at the front side of the mast and subsequently lowered in controlled manner into the well. The hoisting gear is situated some distance directly above the well.

The known drilling rig is further provided with a rig floor which forms an integral carrying component thereof and is rigidly connected to the mast. An opening is formed in this rig floor for passage of the drill pipes. Means are further present on this rig floor with which the drill pipes can be rotatively driven, usually in the form of a rotary table having therein a displacing rod of non-round cross-section, the so-called kelly.

Finally, the drilling rig is further provided with means for pumping a drill fluid downward through the drill pipes into the ground, whereafter this drill fluid comes up again through the hollow space between the drill pipes and the wall of the well.
The drilling rig is thus in fact a crane with multiple functions, i.e. the raising or lowering of the drill pipes, the rotation of the drill pipes during the drilling process, and storage of the drill pipes during changing of the drill head.

In modern drilling rigs use is in fact usually made, instead of a rotary table in the rig floor, of a so-called "top drive" at the top of the mast to rotate the drill pipes. Such a top drive consists of one or more motors connected via a transmission to a rotatable connecting piece to which one drill pipe at a time is attached. The top drive is suspended from the hoisting gear in the mast and can be moved up and downward thereby.

The basic functions of the drilling rig are therefore to move the drill pipes up and downward in controlled manner, to impart a rotating movement to the drill pipes if necessary, and to pump drill fluid. The controlled movement of the drill pipe comprises of compensating for the downward force exerted by the force of gravity on the drill pipes, so their weight.

Use is made for the drilling process of drill pipes of a limited length which, when screwed together, form the final drill string. Due to the physical limitation of the drill pipes and the screwing required, the process of constructing a drill string is an interrupted process of placing and screwing on new pipes and subsequently lowering the whole drill string. The drill string can herein move no further downward each time than the length of the newly placed drill pipe. During placing of each new drill pipe the drill string is stationary and is supported by a non-movable mechanical support in the form of the rig floor. The actual hoisting gear is used during this operation for placing of the new drill pipe to be screwed on.
During the whole drilling process the drill string is supported by the rig floor during the stationary part of the movement process and by the hoisting gear of the drilling rig during the dynamic part.

The above described process can also take place in reverse sequence, wherein the drill string is pulled up in steps by the hoisting gear.

In addition to the above described basic functions of the drilling rig, control of the pressures occurring in the well are an important factor in the overall drilling process. Controlling of the pressures occurring in the well, also referred to as well control, is based on the principle that the force exerted on the well by the column of liquid, the drill fluid, is equal to or slightly greater than the ground pressure present in the well. This is referred to as "balanced", or even as "overbalanced", drilling.

Mounted on the well are blowout preventers which can close the well if said balance were to be temporarily disrupted. If the ground pressure becomes greater than the back-pressure exerted by the liquid column, the liquid column will then be pressed upward out of the well. This is prevented by closing blowout preventers, whereafter the balance can once again be restored by increasing the weight of the liquid column, and the drilling process can hereby be resumed.

In order to be also able to maintain this overbalanced drilling process in rocks with a high permeability and porosity, two prerequisites necessary to be able to speak of a reservoir rock, the drill fluid is provided with solids. These solids serve to reduce the permeability of the reservoir rock by cementing, in order to give sufficient support to enable support for the liquid column essential to the drilling process.
This cementing, which is essential during the drilling process, has the effect of slowing production considerably during the production phase of the well. As the prevailing ground pressure decreases due to the extraction of oil or gas from the well during the production phase, an increasing amount of cementing will be necessary as time passes to enable a liquid column to be supported. The ultimate result hereof is a steadily increasing production loss.

In order to prevent this production loss immediately after the drilling phase as well as during later drilling activities, another method of well control has been developed. In this modified process use is no longer made of the basic principle that the liquid column must compensate the prevailing ground pressure, with all the side-effects this entails. Operation takes place instead with a liquid column which is lighter than the prevailing ground pressure, or a liquid column is even no longer used at all. This new process, in which no liquid column or too light a liquid column is used, is often referred to with the term "underbalanced" drilling.

This fundamental change in the drilling process requires replacement measures which can compensate for the effect of removing (a part of) the liquid column.

The most important measure is that the blowout preventers must be and remain closed, since the ground pressure will no longer be balanced. This underbalanced situation is translated into a pressure in the well which can be detected at the surface. The drill string will also have to be internally safeguarded against the now prevailing well pressure, this being achieved by means of valves closing in one direction.
In addition to these direct modifications, the whole process of handling the drill pipes, thus the moving up and downward and rotating thereof, must now be performed by the now permanently closed blowout preventers. Since the blowout preventers are going to be used in this situation not only in the case of very short-lived disturbances in balance but will serve instead as important component in the performing of a continuous process, additional blowout preventers, diverse of which are specially equipped for this new task, must be placed on the well. This applies all the more because the new process will also cause wear of the valves since the drill pipes are moved through them.

In addition to the above stated results, the well pressure caused by the process change has another consequence. A force which is uniform in all directions will be exerted by the prevailing well pressure, and thus also on the closed underside of the now closed drill string. Since only atmospheric pressure is exerted on the portion of the drill string protruding from the well, the difference in pressure inside and outside the well will result in an upward directed force on the drill string. As soon as this upward directed force becomes greater than the weight of the drill string, which does after all depend on the length of the drill string and so the number of drill pipes, the upward directed force will press the drill string out of the closed well. As the length of the drill string decreases, the upward directed differential force will become increasingly greater. Since a conventional drilling rig is only adapted to overcome the forces caused by the force of gravity, which are by definition directed downward, the upward directed forces caused by the well pressure cannot be controlled by the drilling rig.
In addition to the changed play of forces in the well and the consequences ensuing herefrom, it is no longer possible, due to the operation with closed blowout preventers, to move through the closed blowout preventer drill pipes with a form other than that for which the blowout preventer is designed. In order to be able to do this special techniques, so-called sluice techniques, have been developed which cannot be incorporated directly, and certainly not without consequences, in the normal operating pattern of a drilling rig. Specialist companies are then usually called in for this purpose which have at their disposal suitable equipment, the so-called hydraulic workover units or snubbing units, which must then co-act with the drilling rig already on site.

Making the necessary changes to the system of blowout preventers, arranging the hydraulic workover unit in the conventional drilling rig are not only time-consuming and so expensive, but also involve an increased safety risk.

The invention therefore has for its object to provide a drilling rig with which, in addition to normal drilling, special operations in an underbalanced well can also be performed without use having to be made for this purpose of separate constructions and services of third parties. According to the invention this is achieved in a drilling rig of the above described type in that the carrying means comprise at least three carriers which are connected at different heights to the mast and displaceable in height direction therealong and which are adapted to exert a pulling force or pressing force as required on the drill pipes. By manipulating the drill pipes in suitable manner using these three carriers which are displaceable independently of each other and the lower of which in fact replaces the fixed rig floor of a conventional drilling rig, different functions can
be carried out with one and the same drilling rig in both the overbalanced and underbalanced situation of the well. Because the drilling rig itself is in this way made suitable to not only lower drill pipes in controlled manner into a well but to really press them therein, it is possible to dispense with the use of a separate unit such as a hydraulic workover unit or a snubbing unit when the pressure ratio in the well becomes underbalanced.

When at least the upper carrier has means for rotatingly driving the drill pipes, it can be used in all operations, both drilling and workovers, in an overbalanced situation. In this case it is recommended that the rotating drive means of the upper carrier are formed by a so-called top drive.

The carriers in the drilling rig according to the invention are advantageously adapted to co-act during a "normal" drilling operation when the well is (over)balanced, wherein the upper carrier is adapted to lower drill pipes in a downward movement into the well, and the middle or lower carrier is adapted to take over and hold the drill pipes fixedly at the end of the downward movement. The drilling rig can thus be used conventionally in an overbalanced situation.

The lower carrier is preferably connected releasably to the mast. This lower carrier can thus be removed and stored when it is not required, thus during normal use of the drilling rig, whereby the two other carriers can move unimpeded along the mast.

When the lower carrier has flexible means for connecting thereof to a blowout preventer placed on the well, this prevents the construction of the well being loaded during operations in an underbalanced situation by downward directed forces occurring here.
The middle and lower carrier can then be adapted to co-act during an operation when underbalancing prevails in the well, wherein the middle carrier is adapted to urged components in a downward stroke into the well, and the lower carrier remains in place and is adapted to hold the components fast and to transfer forces that occur into the mast.

The drilling rig is advantageously further provided with at least one platform connected to the mast and displaceable therealong in height direction. Tools and instruments used during drilling can be kept on this platform, which itself does not fulfil a supporting function in the drilling process, and personnel who must be present in the drilling rig can take up position thereon. Because the platform is height-adjustable, the process of assembling the drill string or removing drill pipes therefrom can take place at any desired height.

The platform can be connected to one of the carriers. The number of separate components of the drilling rig can thus be limited.

In a preferred embodiment the drilling rig according to the invention is further provided with a device for supplying drill pipes which co-acts with the carrying means. The process of introducing or removing the drill pipes can hereby be for the greater part mechanized, so that a human contribution is not necessary here, or hardly so. This is important because handling of drill pipes on the rig floor is one of the most hazardous operations on and around a drilling rig. This supply device preferably has means for raising the drill pipes from a lying position and transferring them to the carrying means. The pipes can thus be stored simply lying next to the drilling rig.
The invention further relates to a method for introducing one or more drill pipes into an underbalanced well. As stated, when a well is underbalanced, a separate hydraulic workover or snubbing unit has heretofore been placed adjacent to or in the drilling rig. This hydraulic workover or snubbing unit, which is usually operated by staff specially employed for that purpose, has provisions for urging drill pipes along or through the blowout preventers in the well without oil or gas escaping. The use of such units and the associated staff is expensive and results in long delays.

The invention now has for its object to propose such a method wherein the use of separate installations or the employment of third parties can be dispensed with. According to the invention this is achieved by making use of a drilling rig as described above for introducing one or more drill pipes into an underbalanced well, wherein the method comprises of suspending the drill pipes from the carrying means and urging the pipe(s) downward into the well while exerting a pressing force.

As part of this method the lower carrier is preferably connected in flexible manner to a blowout preventer placed on the well and fixed to the mast prior to urging of the drill pipe(s) into the well. Due to the rigid attachment of the carrier to the mast and its flexible connection to the blowout preventer(s), the well is safeguarded from any downward directed load resulting from the processes carried out by the drilling rig.

The method is advantageously adapted here such that the middle carrier urges the drill pipe(s) in a downward stroke into the well and the lower carrier remains in place, holds the drill pipe(s) fast and transfers forces which occur into the mast. The middle and lower carrier can be provided
for this purpose with holding elements or "slips", of which one engages on the drill pipe and one allows passage of the drill pipe in alternating manner, whereby these slips as it were pass the drill pipes to each other. Because the operations necessary to introduce the drill pipes are performed by the middle and lower carriers, the upper carrier can carry out other operations, such as supplying and fastening to each other or, conversely, taking apart drill pipes, while the space above the middle carrier remains available for temporary storage of the drill pipes.

In another variant of the method according to the invention there is arranged between the middle and lower carrier a system of telescopic sluice tubes, of which a stationary outer sluice tube is fixed to the lower carrier and an inner sluice tube is fixed to the middle carrier and moved thereby. Using such a system of sluice tubes, also referred to as telescopic deployment tubes (TDT), drill pipes of differing forms which cannot be pressed in any other way into an underbalanced well can nevertheless be introduced under pressure into the well.

In this method the drill pipe(s) are advantageously picked up and presented to the middle carrier by the upper carrier. Because the operations necessary for introducing the drill pipes are performed by the middle and lower carriers, the upper carrier and the space above the middle carrier do after all remain available for other operations, such as manipulation of drill pipes using the top drive, fastening together or, conversely, taking apart drill pipes and the like. Operation can hereby take place efficiently and safely.

The drill pipe(s) can herein also be driven rotately by the upper carrier.
The invention will now be further elucidated on the basis of an exemplary embodiment, wherein reference is made to the accompanying drawing, in which:

Fig. 1 is a schematic side view of a drilling rig according to the invention during normal operation, wherein an overbalanced pressure ratio prevails in the well,

Fig. 2 is a view corresponding with fig. 1 of the drilling rig during underbalanced operation, thus when an underbalanced pressure ratio prevails in the well, and

Fig. 3 is a view corresponding with fig. 1 and 2 of the drilling rig used with a system of telescopic sluice tubes.

A drilling rig 1 (fig. 1) which is erected at a drilling location DL comprises a mast 2 which is placed eccentrically in the shown embodiment, so adjacently instead of directly above a well 3 (of which only the upper part is shown here). This mast 2 is placed on a support or substructure 4 around well 3. Connected to mast 2 are carrying means, here in the form of three carriers 5, 6 and 7, of which the lower carrier 7 is releasable (and not shown in this figure). Carriers 5, 6, 7, which are suspended directly above well 3 (as indicated schematically with a dot-dash line) are movable independently of each other in height direction along mast 2. Further suspended from the mast is a platform 8 which is likewise displaceable in height direction. A cabin 9 is situated on this platform 8 on which operatives P can take position.

The upper carrier 5 is provided with means 17 (shown schematically here) for rotatively driving drill pipes to be fastened thereto (not shown here), in the form of a so-called top drive. The middle carrier 6 is also provided with means (not shown here) for rotatively driving the drill pipes, in this case in the form of a rotary table.
Also disposed at the drilling location DL is a supply device 10 with which drill pipes 29, which are stored lying on racks in the vicinity of drilling rig 1, can be carried to drilling rig 1 and raised. This supply device 10 is provided here with an arm 11 which has an engaging member 30 movable therealong which picks up drill pipes 29. By raising the arm 11 and simultaneously rotating engaging member 30 the drill pipe 29 is carried from the lying position to a vertical position at a determined position above platform 8, where drill pipe 29 is then placed. Arm 11 with engaging member 30 then returns to its starting position.

Well 3 is provided on the top side with a system 12 of blowout preventers, a so-called BOP stack. In the shown embodiment, wherein the pressure in well 3 is greater than the pressure in the formation in which drilling takes place and there is therefore an overbalanced pressure ratio, the valve system 12 is opened. In the shown embodiment this valve system 12 is formed by two ram BOPs 13, 14 and an annular BOP 15, while a further conduit 16 for drill fluid is connected to the underside of valve system 12.

Drilling rig 1 is used as follows in this configuration. Supply device 10 feeds one drill pipe at a time which is parked at a position assigned therefor on platform 8. Here the drill pipe is taken over by upper carrier 5 which for this purpose is first displaced along mast 2 to its lowest position 5°. The first carrier 5 is then moved upward, while the drill pipe is moved from its parked position to a position directly above well 3. The drill head (not shown here) is for instance first coupled to the bottom side of the first drill pipe, whereafter each subsequently supplied drill pipe is screwed onto the preceding one.

Once the drill pipe has thus been connected to either the drill head or the preceding drill pipe, the upper carrier
5 is moved downward in controlled manner along mast 2. The drill pipe herein descends into well 3 through an opening in middle carrier 6 and through the normally opened valve system 12. The speed at which upper carrier 5 lowers the drill pipe into well 3 depends on the conditions in well 3.

Simultaneously with lowering thereof, the drill pipe - and with it the whole drill string suspended thereunder - can be set into rotation by top drive 17. Due to the combination of the weight of the drill string and the rotational movement thereof the drill head cuts into the bottom of well 3, which is thereby deepened still further.

When upper carrier 5 has reached its lowest position 5', top drive 17 can be stopped and the drill pipe is engaged by middle carrier 6, or optionally lower carrier 7, which are provided for this purpose with engaging means (not shown here). Top drive 17 is then disconnected from the drill pipe which is then situated roughly at the position of platform 8. Upper carrier 5 then takes over a subsequent drill pipe from supply device 10 and moves upward in order to resume drilling.

When drilling is ended or interrupted, for instance in order to change the drilling head, the above described operations are performed in reverse sequence. The drill string is then lifted by upper carrier 5 per length of the drill pipes out of well 3 and held fast by middle carrier 6, whereafter the uppermost drill pipe is in each case removed and stored.

Should a situation occur during the drilling process in which the formation pressure in well 3 becomes greater than the hydrostatic pressure of the liquid column therein, and should it be desirable to allow this situation to persist, the pressure ratio in well 3 therefore becomes underbalanced. In that case the drilling process can be
interrupted and, by making determined modifications, the
drilling rig and the assembly 12 of blowout preventers can be
made suitable for this new operating situation. Use is made
for this purpose of the fact that the carrying means of

5 drilling rig 1 according to the invention are adapted not
only to exert pulling or lifting forces, but also provide the
option of exerting pressing forces on the drill pipes.

The configuration of drilling rig 1 is then first
modified by suspending the lower carrier 7 from mast 2 (fig.

10 2). This carrier 7 is mounted at a suitable height on mast 2
at the position of the top of valve system 12. This valve
system 12 is usually first expanded, compared to the normal
operating state of drilling rig 1, by adding one or more
additional valves 18, 19, 20 which play a part in the
controlled passage of drill pipes. Compared to the previous
situation, valve system 12 is here further expanded with a
bypass conduit 23 for drill fluid around the annular valve

15 15.

Due to the higher position of valve system 12 the

lower carrier 7 thus comes to lie higher above the ground G
than the middle carrier 6 during normal use of drilling rig 1
when the valve system 12 comprises fewer valves. The fact
that the height of lower carrier 7 can be adjusted is an
advantage compared to conventional drilling rigs, where the
rig floor is placed at a fixed height above the ground and
the space below it is not usually sufficient for placing of
the required additional blowout preventers and hydraulic
workover unit. In conventional drilling rigs a part of this
equipment must therefore be placed above the rig floor, which

25 in turn has consequences for the normal operating process of
the drilling rig. (Under these conditions the actual drilling
rig can usually no longer be used at all, and all further
operations are carried out using the hydraulic workover unit.

Before the drill pipes can be pressed again into well 3 in this operating situation, lower carrier 7 is first connected to valve system 12. This carrier 7 is provided for this purpose with flexible, pressure-tight connecting means (not shown here). Due to the flexibility of these connecting means the well is disconnected mechanically from the drilling rig. Loads occurring in drilling rig 1 during operations under pressure are thus not transmitted into well 3, but are absorbed instead in the construction of carriers 6, 7 and mast 2. These loads are eventually transmitted directly from mast 2 to support 4 and the ground G.

For the purpose of pressing drill pipes into the underbalanced well 3 use is made according to the invention of the middle and lower carriers 6, 7. Upper carrier 5 plays no part in this operation and remains free for use in other operations, such as supplying or removing drill pipes in co-action with supply device 10, rotating the drill pipes and the like. Drilling rig 1 can hereby also be used in the normal manner in this situation, so that no different procedures, with the associated safety hazards, need be introduced. It is therefore also possible to continue working efficiently and, above all, safely in this operating situation.

As stated, lower carrier 7 is fixed to mast 2 once it has been brought to the desired height, kiddle carrier 6 then performs all movements necessary for the process. In order to enable the drill pipes to be pressed through the valve system 12 into the well counter to the formation pressure, the middle and lower carriers 6, 7 are first provided with holding elements or slips 21, 22 which engage on the outer
side of the drill pipes, and the diameter of which can be adjusted to that of the relevant drill pipe.

When a drill pipe is clamped between the middle and lower carriers 6, 7, the diameter of holding element 22 on lower carrier 7 is first enlarged so that the drill pipe can move freely therein. Middle carrier 6 is then moved downward so that the drill pipe is pressed through lower carrier 7 and through the valve system 12. Once the drill pipe has been pressed far enough downward, holding element 22 is tightened so that the drill pipe is fixed by the lower carrier. Holding element 21 on middle carrier 6 is then released so that the drill pipe can move freely therein, whereafter middle carrier 6 is moved upward again so as to engage this or a subsequent drill pipe at a higher point. By thus alternately tightening and loosening holding elements 21, 22 synchronously with displacements of middle carrier 6, the drill pipes are as it were passed between carriers 6, 7.

A similar method as specified above is applied when drilling rig 1 is used to introduce drill pipes of differing cross-sectional form or other components into the underbalanced well 3 using a system 24 of telescopic sluice tubes or TDT (fig. 3). In this case the bottom side of an outer stationary tube 25 is fastened to lower carrier 7 while the inner tube 26 is fastened with its top side to middle carrier 6. While the lower carrier 7 thus holds fast the TDT and transfers forces that occur into mast 2, the middle carrier 6 moves up and downward synchronously with opening and closing of valves 27, 28 of the TDT in order to sluice drill pipes and other components through the TDT into well 3. It is also the case here that upper carrier 5 is left free to carry out other operations.

Using the new drilling rig design according to the invention different operations occurring during a drilling
process can thus be performed, wherein at least in respect of the procedures carried out above ground no distinction need be made between drilling in an overbalanced well and operation in an underbalanced well. It is also possible to dispense with the use of separate equipment and external staff, which results in considerable savings.

Although the invention has been elucidated above on the basis of an embodiment, it will be apparent that it is not limited thereto. All described and shown components of the drilling rig can thus be varied in form, dimensions and number. The different new aspects of the described method and drilling rig can also be used in all manner of combinations, even together with elements of conventional methods or drilling rigs, while retaining the associated advantages.

The scope of the invention is therefore defined solely by the following claims.
Claims

1. Drilling rig, comprising a mast to be placed above or close to a well and means connected to the mast for carrying drill pipes to be lowered into the well, characterized in that the carrying means comprise at least three carriers which are connected at different heights to the mast and displaceable in height direction therealong and which are adapted to exert a pulling force or a pressing force as required on the drill pipes.

2. Drilling rig as claimed in claim 1, characterized in that at least the upper carrier has means for rotatively driving the drill pipes.

3. Drilling rig as claimed in claim 2, characterized in that the rotating drive means of the upper carrier are formed by a so-called top drive.

4. Drilling rig as claimed in any of the foregoing claims, characterized in that the carriers are adapted to co-act during a drilling operation when the well is (over) balanced, wherein the upper carrier is adapted to lower drill pipes in a downward movement into the well, and the middle or lower carrier is adapted to take over and hold the drill pipes fixedly at the end of the downward movement.

5. Drilling rig as claimed in any of the foregoing claims, characterized in that the lower carrier is connected releasably to the mast.

6. Drilling rig as claimed in claim 5, characterized in that the lower carrier has flexible means for connecting thereof to a blowout preventer placed on the well.

7. Drilling rig as claimed in claim 6, characterized in that the middle and lower carrier are adapted to co-act during an operation when underbalancing prevails in the well, wherein the middle carrier is adapted to urged components in
a downward stroke into the well, and the lower carrier remains in place and is adapted to hold the components fast and to transfer forces that occur into the mast.

8. Drilling rig as claimed in any of the foregoing claims or according to the preamble of claim 1, characterized by at least one platform connected to the mast and displaceable therealong in height direction.

9. Drilling rig as claimed in claim 8, characterized in that the platform is connected to one of the carriers.

10. Drilling rig as claimed in any of the foregoing claims, characterized by a device for supplying drill pipes which co-acts with the carrying means.

11. Drilling rig as claimed in claim 10, characterized in that the supply device has means for raising the drill pipes from a lying position and transferring them to the carrying means.

12. Method for introducing one or more drill pipes into an underbalanced well while making use of a drilling rig as claimed in any of the foregoing claims, comprising of suspending the drill pipe(s) from the carrying means and urging the pipe(s) downward into the well while exerting a pressing force.

13. Method as claimed in claim 12, characterized in that the lower carrier is connected in flexible manner to a blowout preventer placed on the well and fixed to the mast prior to urging of the drill pipe(s) into the well.

14. Method as claimed in claim 13, characterized in that the middle carrier urges the drill pipe(s) in a downward stroke into the well and the lower carrier remains in place, holds the drill pipe(s) fast and transfers forces which occur into the mast.

15. Method as claimed in claim 14, characterized in that between the middle and lower carrier there is arranged a
system of telescopic sluice tubes, of which a stationary outer sluice tube is fixed to the lower carrier and an inner sluice tube is fixed to the middle carrier and moved thereby.

16. Method as claimed in any of the claims 12-15, characterized in that the drill pipe(s) are picked up and presented to the middle carrier by the upper carrier.

17. Method as claimed in any of the claims 12-16, characterized in that the drill pipe(s) are driven rotatingly by the upper carrier.
**INTERNATIONAL SEARCH REPORT**

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<th>A CLASSIFICATION OF SUBJECT MATTER</th>
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According to International Patent Classification (IPC) or to both national classification and IPC.

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

E21B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<td>US 6 199 641 B1 (DONNIE R. JAMES ET AL) 13 March 2001 (2001-03-13) column 8, line 66 - column 9, line 39 figures 5,6</td>
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<td>WO 03/048502 A (COMACCHIO S R L [IT]; COMACCHIO PATRIZIO [IT]; COMACCHIO PASQUALINO [I]) 12 June 2003 (2003-06-12) figure 1</td>
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* Special categories of cited documents

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Date of the actual completion of the international search

30 November 2006

Date of mailing of the International search report

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