

Drill Rod Handler

Field of the Invention

The present invention relates to a handling means for elongate items such as lengths of drill rods, poles, pipes and the like.

- 5 Throughout the specification the term "drill rod" will be taken to include all forms of elongate members used in the drilling, installation and maintenance of bore holes and wells in the ground and will include rods, pipes, tubes and casings which are provided in lengths and are interconnected to be used in the borehole.

Background

- 10 One particular application of the invention relates to an accessory which can be used with drill rigs which are to be used in drilling bore holes. Such drill rigs generally comprise an upstanding mast which has a drill head mounted to it where the drill head is capable of movement along the mast and the drill head is provided with means which can receive and engage the upper end of a drill string
- 15 and can apply a rotational force to the drill string to cause it to rotate within the bore hole whereby such rotation results in the cutting action by the drill bit mounted to the lower end of the drill string. The drill string comprises a number of lengths of drill rod which are connected end to end and where the length of drill rod generally is at the most equal to the height of the mast. It is usual that each
- 20 length of the length of drill rod can be up to a length of the order of six metres. During a drilling operation when the drill head has reached the lower end of the mast, the drill string is clampingly retained and the drill head is disconnected from the drill string. A fresh length of drill rod is then raised into position in order that the upper end of the fresh length is engaged to the drill head and the lower end of
- 25 the fresh length is engaged with the upper end of the drill string. Once the fresh length of drill rod has been installed, the drilling operation can recommence until the drill head again reaches the lower end of the mast. During drilling activities of deep bore holes which may extend for hundreds of meters, it is necessary to locate fresh lengths of drill rod into a drill string at very regular intervals.

It is usual that the drill rig is mounted to the chassis of a motorised vehicle such as a truck or lorry and that the lengths of drill rod are mounted in a storage zone such that they lie horizontally in a stacked array beside the drilling mast on the same vehicle or alternatively on a vehicle parked alongside the drilling rig or on the ground beside the drilling rig.

The usual method for raising a fresh length of drill rod from the bin to the mast comprises mounting a holder along the length of the length of drill rod connecting that holder to a cable carried by a winch located at the upper end of the mast and then lifting the length of drill rod into position. This requires manipulation by a member of the drill rig crew who is required to support and guide the lowermost end of the length of drill rod as the length of drill rod is being raised into position. Due to the nature of drilling sites, this action can be quite hazardous. In addition, during the raising of the drilling drill rod, it has been known for the upper portion of the length of drill rod to strike some obstruction on the drill mast which causes the lower end to move in an unpredictable manner which can result in injury to the crew member. In addition, this process requires joint coordination between the crew member guiding the one end and the other crew member controlling the winch.

Similarly during the raising of a drill string, it becomes necessary to regularly remove lengths of drill rod from a drill string and locate those lengths in the storage zone located beside the mast which may be either located on the same vehicle as the drilling rig or on some adjacent vehicle or on the ground beside the drilling rig. This can also create hazards for the personnel required to handle and store the lengths of drill rod.

In the past alternative arrangements have been proposed for the handling of drill rods and examples of such are described in AU693382 and US6298927.

The discussion throughout this specification, of the background and prior art to the invention is intended only to facilitate an understanding of the present invention. It should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was part of the common general knowledge in Australia or the world as at the priority date of the application.

It is an object of this invention to provide a means of supporting and handling elongate item such as lengths of drill rod between the storage area for those items and the erect position which can reduce the likelihood of injury to personnel.

It is also an object of the invention to improve the efficiency of drill rod handling.

5 Disclosure of the Invention

Throughout the specification and claims, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

- 10 According to one aspect the invention resides in a handler for an elongate item, comprising: an arm which is adapted to be supported at one end, the other end of the arm providing an elongate member support for receiving an elongate item and moving it axially from a first position along a first axis which is parallel to the elongate item into engagement with the elongate member support; the elongate
- 15 member support being rotatable on the radial arm about a second axis which is transverse to the first axis to enable the elongate item to be moved to an erect position; and the one end of the arm being mounted to enable movement of the elongate member about a third axis into a second position.

- According to another aspect the invention resides in an elongate item handling
- 20 means comprising a base adapted to be fixed to a fixture, an elongate member support having a first axis, the elongate member support comprising an engagement means adapted to engage an elongate item and support the elongate item such that it is parallel to the first axis and to move the elongate item into engagement with the elongate member support, wherein the elongate
- 25 member support is supported from the base to be rotatable about a second axis which is transverse to the first axis whereby the elongate item when supported from the elongate member support can be moved between an upright position and a substantially horizontal position, the base being movable on the fixture between a first position located at a desired erect position of the elongate item and one or
- 30 more positions clear of the first position, said elongate member support.

According to a preferred feature of the invention the fixture comprises a drilling rig having a drilling mast which is associated with a drill string located in a borehole and the elongate item comprises a length of drill rod and wherein the upright axis is substantially parallel to the axis of the drill string.

- 5 According to another aspect the invention resides in a drill rod handling means which in use is intended to be mounted to a drill rig adjacent a drilling mast which is associated with a drill string located in a borehole, the handling means comprising a base adapted to be supported from the drill rig and an elongate member support having a first axis and having an engagement means which is
- 10 adapted to engage a length of drill rod such that the length of drill rod is parallel to the first axis and to move the length of drill rod longitudinally into and out of engagement with the elongate member support, the elongate member support being supported from the base to be rotatable about a second axis transverse to the first axis whereby a length of drill rod when supported from the elongate
- 15 member support can be moved between an upright position and a substantially horizontal position, wherein the upright axis is substantially parallel to the axis of the drill string, the base being movable relative to the drill rig when the length of drill rod is in the erect position between a first position at which the length of drill rod is in substantial alignment with the drill string and one or more positions clear
- 20 of the first position.

- According to another aspect the invention resides in a drilling system comprising a drilling mast which is to be associated with drill string located in a bore hole and a drill rod handling means which in use is intended to be mounted adjacent the drilling mast, the handling means comprising: a base adapted to be supported
- 25 from the drill rig; and an elongate member support having a first axis and having an engagement means which is adapted to engage a length of drill rod such that the length of drill rod is parallel to the first axis and to move the length of drill rod longitudinally into and out of engagement with the elongate member support; the elongate member support being supported from the base to be rotatable about a
- 30 second axis transverse to the first axis whereby a length of drill rod when supported from the elongate member support can be moved between an upright position and a substantially horizontal position; wherein the upright axis is substantially parallel to the axis of the drill string; the base being movable relative

to the drilling mast when the length of drill rod is in the erect position between a first position at which the length of drill rod is in substantial alignment with the drill string and one or more positions clear of the first position.

5 According to a preferred feature of the invention the elongate member support comprises a set of clamp elements which are movable to be able to clampingly engage the length of drill rod and to be disengageable from the length of drill rod.

10 According to a preferred feature of the invention the elongate member support further comprises an elongate extension, the engagement means being mounted to the extension to be movable along the extension towards and away from the clamp elements to cause the movement of the elongate item into engagement with the elongate member support respectively.

An According to a preferred feature of the invention the engagement member includes a clamping means to enable the engagement member to clampingly engage the elongate item.

15 According to a preferred feature of the invention the elongate member support is rotatable on the base about the first axis and the central axis of the length of drill rod when engaged by the elongate member support is spaced from the first axis.

20 According to a further preferred feature of the invention, the base comprises a radial arm which supports the elongate member support towards one end and which adapted to be supported at its other end from the drill rig to be rotatable about a third axis which is substantially parallel to the drill string wherein the rotation of the radial arm about the third axis causes the movement of the length of drill rod between the first position and the one or more positions clear of the first position.

25 According to another aspect the invention resides in a method of installing lengths of a drill rod into a drill string associated with a drilling mast comprising providing a handler which engages a length of drill rod located beside the drilling mast by engaging the length of drill rod intermediate its length, moving the length of drill rod axially such that an end portion is engaged by an elongate member support,

engaging the elongate member support with the lower end, rotating the length of drill rod about an axis which is transverse to the axis of the length of drill rod to an erect position which is substantially parallel to the drill string, moving the length of drill rod to a position at which it is aligned with the drill string and locating the
5 length of drill rod into the drill string.

According to another aspect the invention resides in a method of removing a length of drill rod from a drill string associated with a drilling mast comprising providing a handler having an elongate member support which engages the uppermost length of drill rod of the drill string at a position towards the lower end
10 of the length of drill rod, moving the length of drill rod to a position at which it is clear of the drill string and is located adjacent a desired position for the length of drill rod, rotating the length of drill rod about an axis which is transverse to the axis of the length of drill rod to a substantially horizontal position beside the drilling mast, moving the length of drill rod axially out of engagement with the elongate
15 member support and disengaging the length of drill rod from the handler.

The invention will be more fully understood in light of the following description of one specific embodiment.

Brief Description of the Drawings

The description is made with reference to the accompanying drawings of which:

20 Figure 1 is an isometric view of the rod handler according to the first embodiment associated with a drilling mast at the point in time when a rod has been initially engaged by the engaging means;

Figure 2 is an isometric view corresponding to Figure 1 showing the engagement means in its movement along the elongate member support;

25 Figure 3 is an isometric view corresponding to Figures 1 and 2 showing the length of drill rod in its final position on the elongate member support;

Figure 4 is an isometric view corresponding to the previous drawings illustrating the rod being raised from the storage bin;

Figure 5 is an isometric view corresponding to the previous illustrations illustrating the length of drill rod when raised to its erect position;

Figure 6 is an isometric view illustrating the elongate member support having being pivoted about the radial arm about the second axis;

- 5 Figure 7 is an upper isometric view of the first embodiment illustrating the radial arm at an intermediate position between its loading positions and its final position;

Figure 8 is an isometric view corresponding to Figure 7 illustrating the radial arm and drill rod in its final position on the drilling mast.

Detailed Description of Specific Embodiment

- 10 The embodiment is directed to a drill rod handling means which can be incorporated into a drill rig either as an attachment or as an integral part of the drill rig. Such drill rigs generally comprise an upstanding mast 10 which extends upwardly from a slips table 12 (see Figures 7 and 8) and which has a drive head (not shown) which is movable along the mast between a lower position adjacent
15 the slips table and a raised position towards the free end of the mast. The mast is pivotable on its mounting about a transverse axis which is substantially contained within the plane of the slips table. The pivotal movement of the mast is controlled and enables the mast to adopt variety of erect positions which can include the horizontal or vertical position to enable a bore hole to be drilled at any desired
20 angle.

- The drilling rig of the embodiment is intended to be typically mounted to a vehicle (not shown). In other embodiments, the drilling rig can be transported by a vehicle and then left in a stationary position when de-coupled from the vehicle. In yet other embodiments, the drill rig can be configured to be portable by itself,
25 for example, in the same manner as a *Mini Sonic*® drilling rig.

The drill head is provided with means which can receive and engage the upper end of a drill string (not shown) and can apply a rotational force to the drill string to cause it to rotate within the bore hole whereby such rotation results in the cutting action by the drill bit mounted to the lower end of the drill string. In addition, the

drill head may have means for applying a downward force to the drill string and is associated with a compressed air source to provide compressed air to the drill bit to facilitate penetration clearance of cuttings from the bore hole and the operation of fluid operated hammers that may be associated with the drill bit or string. As well, in some instances, the drill head can optionally apply vibrational energy for sonic drilling processes as known in the art.

The drill string comprises a number of lengths of drill rod 21 which are connected end to end and where the length of any individual drill rod is generally, at the most, equal to the height of the mast (e.g. approximately six metres). During a drilling operation when the drill head has reached the lower end of the mast, the drill string is retained to the mast and the drive head is disconnected from the drill string to be raised to the upper end of the mast. A fresh length of drill rod is then raised into position in order that the upper end of the next drill rod is engaged to the drill head and the lower end of the drill rod is free. The drill head then moves the next drill rod downward to engage the upper end of the drill string. Once the next drill rod has been installed, the drilling operation can recommence until the drill head again reaches the lower end of the mast. During drilling activities of deep bore holes which may extend for hundreds of meters, it is necessary to locate fresh lengths of drill rod into a drill string at very regular intervals. It is usual that the drill rig is provided with a storage zone 23 which can accommodate the lengths of drill rod which are to be used such that they lie horizontally in a stacked array beside the drilling mast on the same vehicle or alternatively on a vehicle parked alongside the drilling rig or on the ground beside the drilling rig.

In the past, the usual method for raising a fresh length of drill rod from the bin to the mast comprises mounting a holder to an intermediate position along the length of the length of drill rod connecting that holder to a cable carried by a winch located at the upper end of the mast and then lifting the length of drill rod into position. This requires extensive manual intervention by a member of the drill rig crew who is required to support and guide the lowermost end of the length of drill rod as the length of drill rod is being raised into position. In addition, this process requires joint coordination between the crew member guiding the one end and the other crew member controlling the winch. In the reverse process of removing the lengths of drill rod, similar amounts of manual labour are needed to control the

combination of the drill rod and the winch cable. And sometimes during the raising of a drill string, it becomes necessary to regularly remove lengths of drill rod from the drill string and locate those lengths in a vertical storage rack located beside the mast which may be either located on the same vehicle as the drilling rig or on some adjacent vehicle or on the ground beside the drilling rig.

It is an object of the drill rod handling means according to the embodiments described herein to enable drill rods to be picked up from a storage zone 23 located in close proximity to the mast of the drill rig and delivered into position in alignment with the drill string located in the bore hole without the need of a crew member to manipulate and support the drill rod in its movement between the storage zone 23 and drill string and without the use of a winch cable. The drill rod handling means according to the embodiments described herein provides that once the length of drill rod is in position the drive head which supports the upper end of the drill string can be engaged with the upper end of the length of drill rod to enable the length of drill rod to then be lowered into engagement with the upper end of the drill string.

The drill rod handling means according to the illustrated embodiment comprises a radial arm 11 and an elongate member support 13. The elongate member support 13 has a first axis X and an elongate extension 17. The elongate extension extends to one side of the elongate member support 13 and is substantially coincidental with the first axis X. The elongate member support member comprises a retaining mechanism, such as a pair of clamps 15, which can be spaced longitudinally along an axis parallel to the first axis and each clamp comprises a pair of clamping elements which are movable towards and away from each other such that they are to engage and retain the side walls of a length of drill rod and whereby when a length of drill rod is supported from the elongate member support 13 it is supported to be parallel to and spaced laterally from the first axis X.

The elongate member support 13 also includes an engagement member 19 which is slidably supported upon the extension member 17 to be movable in a direction parallel to the first axis X. The engagement member 19 comprises a further

retaining mechanism, such as a clamp, which is operable to enable it to selectively engage and hold a length of drill rod.

The elongate member support 13 is mounted to one end of the radial arm 11 and the other end of the radial arm is mounted to or adjacent to the drill mast. The
5 elongate member support is rotatable on the radial arm about a second axis Y which is transverse to the first axis and which comprises a longitudinal axis of the radial arm. The one end of the radial arm 11 is also capable of pivotal movement with respect to the drill rig about a third axis Z which is substantially parallel to the axis of the drill mast and thus the drill string. The range of pivotable movement of
10 the radial arm about this third axis on the drill rig is approximately 270° .

A first powered drive is provided between the radial arm 11 and the elongate member support 13 to enable rotation of the member support 13 about the first axis and a second powered drive is provided between the radial arm 11 and the elongate member support 13 to cause rotation of the elongate member support 13
15 about the second axis while a third powered drive is provided to enable the rotation of the radial arm about the third axis. The powered drive can take any form of drive and can include hydraulic, pneumatic, electrical, mechanical or a like power source

The drill rod handling means according to the embodiment is intended to engage
20 lengths of drill rod 21 which are accommodated in the storage zone 23 which is located to one side of the drilling mast 10. The storage zone 23 may be accommodated upon the vehicle 20 supporting the drill rig or upon another vehicle 20 or supported upon the ground or any other suitable structure in close proximity to the drilling mast 10.

25 The storage zone 23 is defined by any known type of storage mechanism, such as a set of longitudinally spaced U-shaped members 25. The set of longitudinally spaced U-shaped members 25 are capable of rotation about an axis which is located below U-shaped members and which is parallel to the longitudinal axis of the lengths of rod accommodated within the storage zone and parallel to the first
30 axis X when the elongate member support is located proximate the storage zone and the extension overlies the lengths of drill rod therein. The pivotable support

enables the set of U-shaped members to be tipped to cause lengths of drill rod to be positioned ready for engagement with the elongate member support 13.

In operation, the drill rod handling means according to the illustrated embodiment is capable of engaging a length of drill rod 21 in the storage zone 23, locating the
5 length of drill rod into the elongate member support 13, lifting the length of drill rod from the storage zone 23 and then moving it into position on the mast 10 such that it is in alignment with the drill string as shown at Figure 8. To effect this action, the radial arm 11 is caused initially to rotate from a position close to the mast 10 about the third axis Z until that the elongate support lies adjacent one end
10 of the lengths of drill rod located in the storage zone 23.

The elongate member support is then caused to rotate about the second axis Y such that the first axis X of the elongate member support 13 is substantially parallel with the longitudinal axes of the lengths of drill rods 21 stored in the storage zone 23. The elongate member support is then caused to rotate about
15 the first axis X such that the elongate extension 17 closely overlies the lengths of drill rods in the storage zone.

The engagement means 19 is then caused to move longitudinally along the elongate extension 17 towards the outer end of the elongate extension 17 and the further clamp of the engagement means 19 is activated to become engaged with
20 a length of drill rod 21.

The engagement member 19 is then moved longitudinally along the longitudinal extension 17 in the direction of the elongate member support 13, as shown at Figures 2 and 3, such that the length of drill rod 21 enters into engagement with the disengaged clamping elements of the clamps 15. Once the length of drill rod
25 21 is located at the desired position in the elongate member support 13, the clamps 15 are then clampingly engaged with the length of drill rod 21 as shown at Figure 3.

Once the length of drill rod 21 is engaged by the elongate member support 13, it is caused to rotate about the second axis Y to cause the length of drill rod 21 to
30 be lifted from its substantially parallel position within the storage zone 23 as

shown at Figure 4. Then, it is ultimately moved to an erect position as shown at Figure 5 at which it is located in a substantially upright position beside the mast 10 and substantially parallel to the mast 10.

- As depicted in the different positions in Figures 5 and 6, the elongate member support 13 (and the retained drill rod) is then caused to rotate on the radial arm 11 about the first axis X. Because of the transverse displacement of the first axis X from the central axis of the length of drill rod 21, the length of drill rod 21 is caused to rotate about the one end of the radial arm 11 to be located at a position at which can be readily located in alignment with the drill string.
- 10 The radial arm 11 is then caused to rotate about the third axis Y as shown at Figures 7 and 8 to bring the length of drill rod 21 into alignment with the drill string. At this final position the drive head (not shown) of the drill rig can be engaged with the upper end of the length of drill rod 21 to enable it to be engaged with a drill string that is located in the bottom of the mast. In the engagement of the length of
- 15 drill rod 21 with the drill string, the clamping engagement by the clamps 15 may be loosened to allow the length of drill rod 21 to move slidably through the clamping members 15 while still restrained thereby such that it will maintain the alignment of the length of drill rod 21 on its movement into an engagement with the drill string.
- 20 In order to remove a length of drill rod 21 from a drill string the radial arm 11 is initially caused to rotate on the mast 10 about the third axis Z until the clamp 15 is in engagement with the length of drill rod. The clamps are then engaged with the length of drill rod. The radial arm 11 is then cause to rotate on the mast 10 about the third axis Z to bring the outer end of the radial arm proximate the storage zone
- 25 23.

- The elongate member support 13 is caused to rotate on the radial arm 11 about the first axis X such that the length of drill rod supported thereby is located most proximate the storage zone 23. The elongate member support 13 is then caused to rotate on the radial arm 11 about the second axis Y until the length of drill rod is
- 30 located above and parallel to the lengths of drill rod already accommodated within the storage zone.

The engagement member 19 is then moved along the extension member 17 and the further clamp thereof is engaged with the length of drill rod while the clamp 15 is disengaged therefrom. With movement of the engagement member 19 along to the extension member 17 away from the radial arm the length of drill rod is
5 located directly above the lengths of drill rod accommodated in the storage zone and on release from the further clamp the length of drill rod is deposited into the storage zone 23.

It should be appreciated that it is a feature of the present invention that the storage zone 23 can be accommodated upon a truck body 20, trailer or a like
10 vehicle which can be located at any position within the range of the 270° movement of the radial arm on the mast 10.

The present invention is not to be limited in scope by the specific embodiment described herein. The embodiment is intended for the purpose of exemplification only. Functionally equivalent features and methods are clearly within the scope of
15 the invention as described herein.

Claims

The Claims Defining the Invention is as Follows:

1. A handler for an elongate item, comprising:

an arm which is adapted to be supported at one end,

- 5 the other end of the arm providing an elongate member support for receiving an elongate item and moving it axially from a first position along a first axis which is parallel to the elongate item into engagement with the elongate member support:

- 10 the elongate member support being rotatable on the radial arm about a second axis which is transverse to the first axis to enable the elongate item to be moved to an erect position; and

the one end of the arm being mounted to enable movement of the elongate member about a third axis into a second position.

- 15 2. An elongate item handling means comprising a base adapted to be fixed to a fixture,

an elongate member support having a first axis,

- 20 the elongate member support comprising an engagement means adapted to engage an elongate item and support the elongate item such that it is parallel to the first axis and to move the elongate item into engagement with the elongate member support,

- 25 wherein the elongate member support is supported from the base to be rotatable about a second axis which is transverse to the first axis whereby the elongate item when supported from the elongate member support can be moved between an upright position and a substantially horizontal position,

the base being movable on the fixture between a first position located at a desired erect position of the elongate item and one or more positions clear of the first position, said elongate member support.

5 3. An elongate item handling means as claimed at claim 2 wherein the fixture comprises a drilling rig having a drilling mast which is associated with a drill string located in a borehole and the elongate item comprises a length of drill rod and wherein the upright axis is substantially parallel to the axis of the drill string.

10 4. A drill rod handling means which in use is intended to be mounted adjacent a drilling mast which is associated with a drill string located in a borehole, the handling means comprising:

a base adapted to be supported from the drill rig; and

15 an elongate member support having a first axis and having an engagement means which is adapted to engage a length of drill rod such that the length of drill rod is parallel to the first axis and to move the length of drill rod longitudinally into and out of engagement with the elongate member support;

20 the elongate member support being supported from the base to be rotatable about a second axis transverse to the first axis whereby a length of drill rod when supported from the elongate member support can be moved between an upright position and a substantially horizontal position;

wherein the upright axis is substantially parallel to the axis of the drill string;

25 the base being movable relative to the drilling mast when the length of drill rod is in the erect position between a first position at which the length of drill rod is in substantial alignment with the drill string and one or more positions clear of the first position.

5. An drill rod handling means as claimed at claim 4 wherein the elongate member support comprises a set of clamp elements which are movable to

be able to clampingly engage the length of drill rod and to be disengageable from the length of drill rod.

- 5 6. An drill rod handling means as claimed at claim 5 wherein the elongate member support further comprises an elongate extension, the engagement means being mounted to the extension to be movable along the extension towards and away from the clamp elements to cause the movement of the elongate item into engagement with the elongate member support respectively.
- 10 7. An drill rod handling means as claimed at claim 6 wherein the engagement member includes a clamping means to enable the engagement member to clampingly engage the elongate item.
- 15 8. An drill rod handling means as claimed at any one of claims 4 to 7 wherein the elongate member support is rotatable on the base about the first axis and wherein the central axis of the length of drill rod when engaged by the elongate member support is spaced from the first axis.
- 20 9. An drill rod handling means as claimed at any one of claims 4 to 8 wherein, the base comprises a radial arm which supports the elongate member support towards one end and which adapted to be supported at its other end to be rotatable about a third axis which is substantially parallel to the drill string wherein the rotation of the radial arm about the third axis causes the movement of the length of drill rod between the first position and the one or more positions clear of the first position.
- 25 10. A drilling system comprising a drilling mast which is to be associated with drill string located in a bore hole and a drill rod handling means which in use is intended to be mounted adjacent the drilling mast, the handling means comprising:

a base adapted to be supported from the drill rig; and

an elongate member support having a first axis and having an engagement means which is adapted to engage a length of drill rod such that the length

of drill rod is parallel to the first axis and to move the length of drill rod longitudinally into and out of engagement with the elongate member support;

5

the elongate member support being supported from the base to be rotatable about a second axis transverse to the first axis whereby a length of drill rod when supported from the elongate member support can be moved between an upright position and a substantially horizontal position;

wherein the upright axis is substantially parallel to the axis of the drill string;

10

the base being movable relative to the drilling mast when the length of drill rod is in the erect position between a first position at which the length of drill rod is in substantial alignment with the drill string and one or more positions clear of the first position.

15

11.A drilling system as claimed at claim 10 wherein the elongate member support comprises a set of clamp elements which are movable to be able to clampingly engage the length of drill rod and to be disengageable from the length of drill rod.

20

12.A drilling system as claimed at claim 11 wherein the elongate member support further comprises an elongate extension, the engagement means being mounted to the extension to be movable along the extension towards and away from the clamp elements to cause the movement of the elongate item into engagement with the elongate member support respectively.

13.A drilling system as claimed at claim 12 wherein the engagement member includes a clamping means to enable the engagement member to clampingly engage the elongate item.

25

14.A drilling system as claimed at any one of claims 10 to 13 wherein the elongate member support is rotatable on the base about the first axis and wherein the central axis of the length of drill rod when engaged by the elongate member support is spaced from the first axis.

- 15.A drilling system as claimed at any one of claims 10 to 14 wherein, the base comprises a radial arm which supports the elongate member support towards one end and which adapted to be supported at its other end to be rotatable about a third axis which is substantially parallel to the drill string wherein the rotation of the radial arm about the third axis causes the movement of the length of drill rod between the first position and the one or more positions clear of the first position.
- 16.A method of installing lengths of a drill rod into a drill string associated with a drilling mast comprising providing a handler which engages a length of drill rod located beside the drilling mast by engaging the length of drill rod intermediate its length, moving the length of drill rod axially such that an end portion is engaged by an elongate member support, engaging the elongate member support with the lower end, rotating the length of drill rod about an axis which is transverse to the axis of the length of drill rod to an erect position which is substantially parallel to the drill string, moving the length of drill rod to a position at which it is aligned with the drill string and locating the length of drill rod into the drill string.
- 17.A method of removing a length of drill rod from a drill string associated with a drilling mast comprising providing a handler having an elongate member support which engages the uppermost length of drill rod of the drill string at a position towards the lower end of the length of drill rod, moving the length of drill rod to a position at which it is clear of the drill sting and is located adjacent a desired position for the length of drill rod, rotating the length of drill rod about an axis which is transverse to the axis of the length of drill rod to a substantially horizontal position beside the drilling mast, moving the length of drill rod axially out of engagement with the elongate member support and disengaging the length of drill rod form the handler.
- 18.An drill rod handling means substantially as herein described with reference to the accompanying drawings.
- 19.A drilling system substantially as herein described with reference to the accompanying drawings.

20. A method of installing lengths of a drill rod into a drill string associated with a drilling mast substantially as herein described with reference to the accompanying drawings.
- 5 21. A method of removing a length of drill rod from a drill string associated with a drilling mast substantially as herein described with reference to the accompanying drawings.