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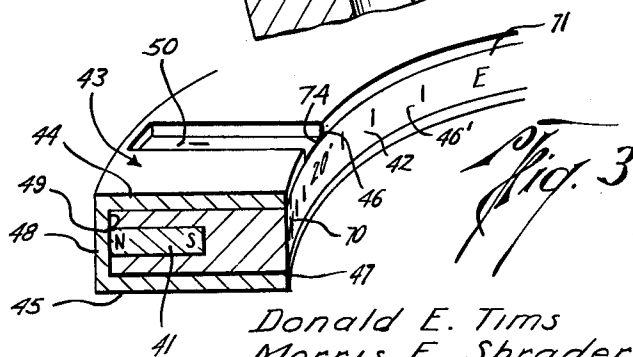
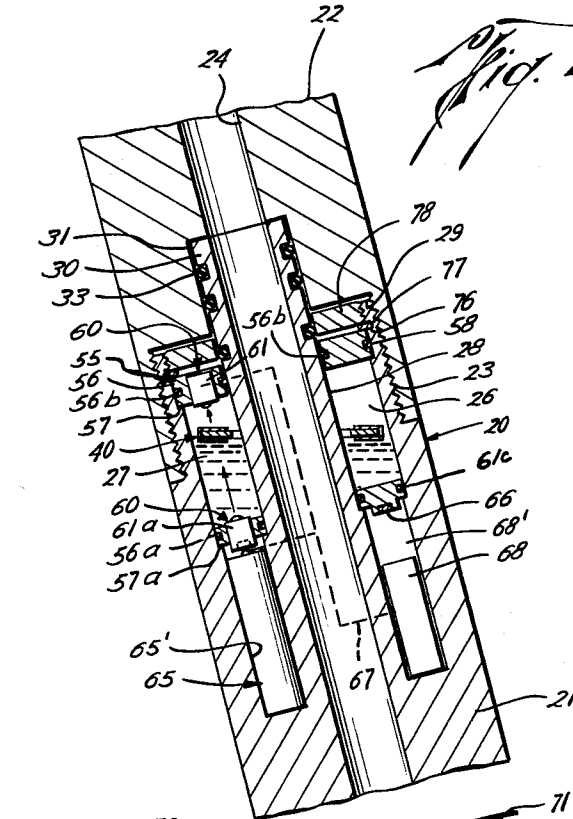
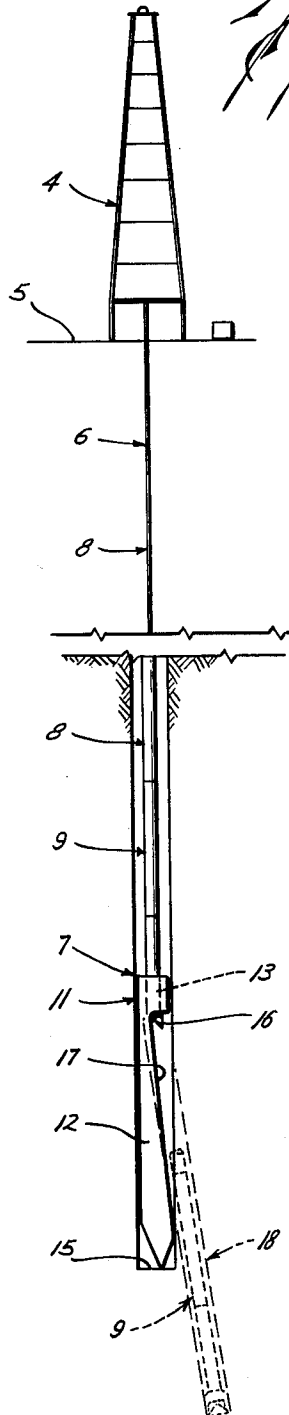
D. E. TIMS ET AL

3,100,019

APPARATUS FOR BOTTOM HOLE ORIENTATION

Filed Aug. 22, 1960

2 Sheets-Sheet 1



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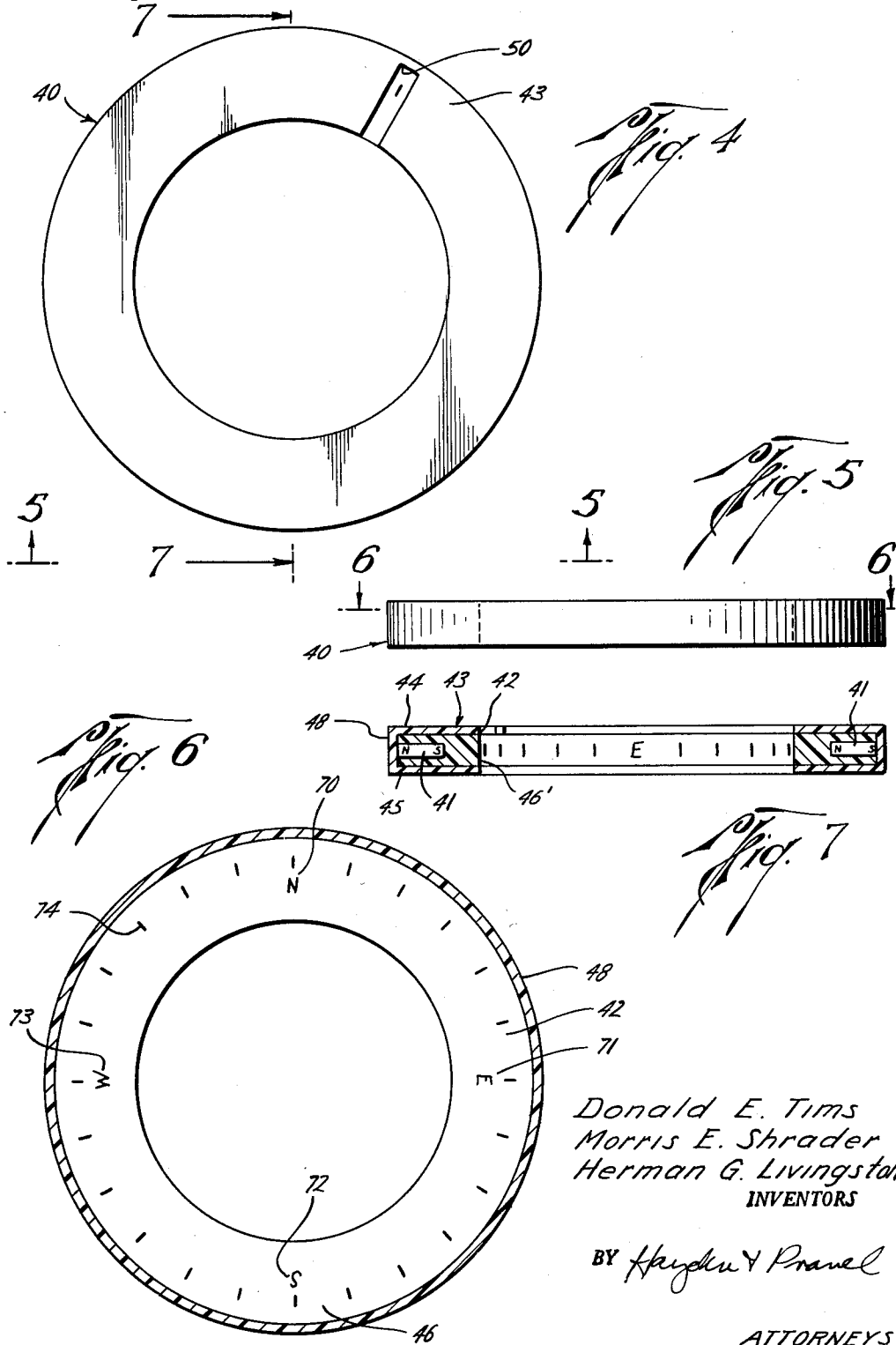
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APPARATUS FOR BOTTOM HOLE ORIENTATION
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The present invention relates to new and useful apparatus for orienting devices in well bores.

In order to deflect and drill a well bore in a desired direction relative to the direction in which the well bore is proceeding, it is necessary to provide some arrangement for positioning or guiding the drill bit in the direction in which the well bore is to be deflected. For example, one device suitable for guiding a drill bit so as to drill a deflected well bore is a whipstock which is provided with a sloping guide surface for guiding the drill bit laterally in the well bore. Other devices may be used to accomplish the same function, including, for example, an arrangement in the drilling bit whereby the discharge of drilling fluid therethrough in and of itself urges the drill bit laterally in the well bore so as to offset the drill bit in the well bore to drill a deflected portion.

Regardless of the means used to urge the drill bit laterally of the well bore to initiate the drilling of the deflected portion, it is desirable, if not necessary, to first determine the direction and inclination of the well bore at the point where it is desired to drill the deflected portion. Therefore, after the deflecting tool is lowered into position in the well bore, a survey instrument of a construction well known in the art is lowered through the drill string in order that the direction and inclination of the well bore may be obtained. This procedure also enables the operator to determine in which direction the deflecting device on the well string is facing, and with this information the drill string and deflecting device is then rotated in the well bore in an endeavor to orient the device in relation to the known direction and inclination of the well bore.

When the operator has rotated the drill string to orient the device, the survey instrument is again lowered through the drill string and a second survey is taken. If the information obtained from the survey instrument when it is retrieved to the earth's surface indicates that the deflecting device is not yet positioned properly so as to drill the deflected portion of the well bore in the desired direction, the drill string is again rotated. The survey instrument is then again lowered into and seated in the drill string and is then retrieved from the drill string in order that the information obtained thereby may be utilized by the operator to determine whether or not the deflecting device is facing in the proper direction so that the deflected portion of the well bore will in turn be drilled in the proper direction.

The above procedure is repeated, that is the rotation of the drill string is stepwise continued with surveys taken in between the sequential rotation of the drill string, until the information obtained from the survey instrument indicates that the deflecting device is positioned properly in the well bore so as to in turn urge the drill bit laterally of the well bore in the direction in which it is desired to drill the deflected well bore. After the device has been oriented in the desired direction, the drilling operations may then be commenced so as to drill the deflected well bore.

It can be appreciated that the lowering and seating of the survey instrument in the drill string and the subsequent withdrawal of the survey instrument is an extremely expensive and time consuming operation. Additionally, under some conditions it is extremely desirable, if not necessary, to maintain proper circulation in the well bore at all times. Therefore, when the survey instrument is seated in the drill string, it restricts the flow of drilling

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fluid through the drill string, and in those circumstances where it is desirable to maintain circulation, the restriction of the flow of drilling fluid by the survey instrument is extremely undesirable and hazardous.

The present invention provides a means whereby a device may be oriented in a well bore which eliminates the repeated lowering and raising of a survey instrument in the drill string as the device is being oriented.

Still another object of the present invention is to provide an apparatus which can be positioned in a well string and is constructed and arranged to enable a device in the well string to be oriented in a desired direction.

Still another object of the present invention is to provide an apparatus to enable a deflecting device to be readily oriented in a well bore, which apparatus is constructed and arranged so as to relay a signal to the operator when the deflected device has been oriented properly in the well bore.

Yet a further object of the present invention is to provide an apparatus for orienting a device on the lower end of a well string in a well bore, which apparatus orients the device in a desired direction.

Still a further object of the present invention is to provide an apparatus which relays a signal to the driller when it is oriented in the desired direction.

Still a further object of the present invention is to provide an apparatus for orienting a device on the lower end of a well string which does not restrict the flow of drilling fluid therethrough as the device is being oriented.

Yet a further object of the present invention is to provide a device for orienting a jet bit in a well bore in a desired direction.

Still another object of the present invention is to provide an apparatus which enables a driller to readily reorient a jet drill bit in a predetermined desired direction, without first removing the well string from the well bore.

Yet a further object of the present invention is to provide an apparatus for orienting a device on the lower end of a well string in a well bore which incorporates a magnetic compass on which the direction in which it is desired to deflect the well bore may be indicated, means for indicating the direction in which the device is oriented when it is initially connected in the well string, and additional means electrically connected with said last named means to create a signal when said last named means is aligned relative to the direction indicated on said magnetic compass for indicating when the device has been oriented to the desired direction in the well bore.

Still another object of the present invention is to provide an apparatus adapted to be secured in a well string for orienting a device on the lower end of the well string, which apparatus is constructed and arranged so that the device may be oriented in the well bore merely by rotating the well string until the device is oriented in the desired direction, and means for creating a signal when the device has been oriented to the predetermined direction as an indication that the orientation is completed.

Still a further object of the present invention is to provide an apparatus for orienting a device on the lower end of a well string which device includes a non-magnetic body for supporting a compass assembly therein, which compass assembly includes a magnetic compass, means thereon for indicating the direction in which the device is to be oriented, means for indicating the original direction in which the device is oriented, when it is secured on the well string and lowered into the well bore, the well string and non-magnetic body being rotatable relative to the magnetic compass so as to align the device on the well string with the direction indicated on the compass, and signal means to create a signal when the device has been oriented to the predetermined direction as indicated on the magnetic compass.

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In some situations it is desirable to orient various devices other than the drill bit, such as packers, sidewall samplers, or other tools, and the present invention provides an apparatus which can be supported in the well string, or on a cable, and which enables any tool or device to be oriented in the well bore in a desired direction.

Yet a further object of the present invention is to provide a means for orienting a deflecting device in a well bore.

Yet a further object of the present invention is to provide an apparatus which enables a deflecting device secured in and movable with a drill string to be reoriented while in the well bore to be oriented in a well bore and which enables the deflecting device to be reoriented as may be necessary to drill a deflected portion of a well bore in a desired direction.

Other objects and advantages of the present invention will become more readily apparent from a consideration of the following description and drawings wherein:

FIG. 1 is a schematic view of a well string in a well bore, with the bottom portion thereof enlarged and illustrating the present invention incorporated therein for orienting a deflecting device on the lower end of the well string;

FIG. 2 is an enlarged vertical sectional view of the central portion of the body of the present invention and showing the relationship of the components when a deflected portion is being drilled;

FIG. 3 is an enlarged fragmentary isometric view of a portion of the magnetic assembly of the present invention;

FIG. 4 is a top plan view of the magnetic assembly;

FIG. 5 is an end view on the line 5—5 of FIG. 4;

FIG. 6 is a sectional view on the line 6—6 of FIG. 5 and showing compass points on the magnetic assembly; and

FIG. 7 is a sectional view on the line 7—7 of FIG. 4. Attention is first directed to FIG. 1 of the drawings wherein a drilling rig designated generally by the numeral 4 is illustrated as being positioned on the earth's surface 5 at the top of the well bore illustrated generally at 6. In FIG. 1 the bottom part of the well bore is shown enlarged as indicated generally at 7 to more clearly illustrate the well string 8 and the functioning of the present invention. The well string 8 extends upwardly to the earth's surface and is supported by the derrick 4.

The device of the present invention is illustrated generally by the numeral 9 in FIG. 1 and is shown as being connected into the well string. The device to be oriented on the lower end of the well string is indicated generally by the numeral 11 and in the form as illustrated is a whipstock 12. The whipstock 12 is secured to the well string 8 by any suitable means such as the shear pin 13, which shear pin is adapted to shear when the whipstock 12 is set on the bottom 15 of the well bore and the well string 8 then lowered to enable the bit 16 to be guided along the face 17 of the whipstock laterally of the well bore so as to drill the deflected portion of the well bore in dotted line as designated generally at 18.

Other forms of devices may be used for deflecting the drill bit 16 laterally of the well bore, one of such arrangements being the provision of jets of varying size in the drill bit 16 so that when drilling fluid is circulated downwardly through the well string 8 and discharged through the bit 16 at the bottom of the well bore, the bit 16 is moved laterally of the well bore whereupon the drill string 8 is rotated to drill the deflected portion 18.

Regardless of the form of device used for urging the drill bit laterally of the well bore to position the bit 16 so that it may drill the deflected portion 18, such means must be oriented in the well bore in the desired direction so that it will in turn guide the drill bit 16 in the

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predetermined or desired direction in which the deflected portion 18 of the well bore is to be drilled.

It can be appreciated that as the deflecting device is lowered into the well bore, which may be many thousands of feet deep in the earth's surface, rotation of the well string and the device connected thereto will occur. When the device is positioned on bottom, the well string must then be rotated so as to position the deflecting device 11 in the proper manner in the well bore so that when the well string 8 is subsequently rotated so as to rotate the drill bit 17, such drill bit will move in the desired offset direction.

Where a whipstock 12 is the means used to deflect the drill bit 16, then it is necessary to position the whipstock so that the face 17 thereof will be in the proper direction so as to drill the well bore in the desired direction. Under some circumstances, the face 17 will be in the same direction as the direction in which the deflected portion is to be drilled, and under some circumstances, the face 17 will be offset relative to the direction in which the deflected portion is to be drilled. This will be discussed in greater detail hereinafter.

As illustrated in FIG. 1 of the drawings the deflected portion is shown in dotted line at 18 and is illustrated as being to the right and continuing downwardly relative to the previous direction of the well bore designated generally at 7. In this situation it will be necessary to face the whipstock 12 so that the guide surface or face 17 thereof is in the position as shown in FIG. 1 of the drawings whereupon when the bit 16 moves downwardly therealong it will drill the portion 18 in the desired direction.

Heretofore, it has been necessary to determine the direction in which the well bore is proceeding, and after lowering the whipstock 12 into the well bore, subsequent surveys are taken by an instrument well known in the art and these surveys are then related to the known direction of the well bore. The whipstock 12 is then rotated until the instrument survey obtained from the well bore with the whipstock in the well bore indicates that it is in the desired direction in relation to the known direction in which the well bore has been proceeding. The survey instrument will be raised and lowered through the drill string as many times as necessary until the device to be oriented is faced in the proper direction to enable the deflected well bore to be drilled in the desired direction.

It can be appreciated that the foregoing procedure is time-consuming and expensive.

The apparatus 9 comprising the present invention enables the device 12 on the well string to be oriented quickly and easily without the necessity of repeatedly lowering and raising a survey instrument to obtain information as to the direction in which the device to be oriented is facing.

The construction of the apparatus 9 is illustrated in greater detail in FIG. 2 and is shown as including the body designated generally at 20, which is formed of non-magnetic material. The body 20 forms a sub which is adapted to be connected in the well string 8, and to accomplish this function suitable threaded portions may be provided thereon (not shown) for engaging with the threaded surfaces on the well string.

The body 20 is shown as comprising two portions 21 and 22 which are threadedly secured together as illustrated at 23. The body 20 is provided with a bore 24 extending longitudinally therethrough for communicating the well string connected thereabove with the well string 16 connected therebelow for circulating drilling fluid, if desired, through the body 20 while the device 12 is being oriented. This reduces the possibility of sticking of the well string and device in the well bore as the device is oriented, which sticking may occur in a relatively short period of time and if it occurs requires a fishing operation to remove the stuck well pipe.

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A void 26 is provided in the body 20, and as illustrated in FIG. 2 of the drawings it will be noted that the void 26 extends longitudinally of the portion 21 of the body 20 and surrounds the bore 24 extending longitudinally in the body 20. The void 26 is spaced from the bore 24 so that the void 26 is ring shaped in cross section. It will be further noted that in the form of the invention illustrated in FIG. 2 of the drawings the void 26 extends axially of the body 20 and is adapted to receive a transparent liquid 27 therein for a purpose as will be described in greater detail hereinafter.

The spaced relationship of the void 26 which is concentric with the bore 24 provides the annular wall portion 28 which extends above the end 29 of the portion 21 of the body 20 as shown in FIG. 2 of the drawings. The upwardly extending portion 30 of the annular wall 28 is telescopically received within the counter bore 31 in the body portion 22 as shown in FIG. 2 of the drawings. Suitable seals as shown at 33 are provided for inhibiting the leakage of fluid around the portion 30 within the counter bore 31.

A magnetic assembly designated generally at 40 is adapted to be received within the void 26. Such assembly is shown in greater detail in FIG. 3, and includes the permanent magnets 41 which are mounted or carried on the transparent, non-magnetic ring shaped carrier 42. The permanent magnets 41 are mounted in carrier 42 so that they are magnetically aligned with each other and will seek magnetic North.

To this end, the other components of the device in the body 20 will be shielded, electrically and magnetically, from the assembly 40 by means well known in the art, and not illustrated herein. Slidably positioned on the ring shaped transparent carrier 42 is the non-magnetic, non-transparent cover 43 which is generally U-shaped as more clearly illustrated in FIG. 3 of the drawings and includes the two sides 44 and 45 which slidably engage the top and bottom 46 and 47 respectively, of the ring shaped carrier 42. The base of the U-shaped cover 43 is shown at 48 and extends between the portions 44 and 45 so as to connect them together. It encloses the end surface 49 of the ring shaped carrier 42 as shown in FIG. 3 of the drawings. The U-shaped cover 43 is provided with a radial slot 50 which extends in the sides 44 and 45 as shown in the drawings. The function of the radial slot 50 will be described in greater detail hereinafter. The carrier 42 may be formed of plastic which is transparent. The cover 43 may also be of plastic, but colored to make it non-transparent.

Suitable means are provided for indicating the orientation of the device 12 on the well string 8 when it is initially secured thereto, such means being shown in the drawings and referred to generally by the numeral 55. As shown in the drawings, the means 55 includes the ring shaped, non-magnetic carrier 56 which is supported on the shoulder 57 of the counterbore 58 within the void 26. A similar ring shaped, non-magnetic carrier 56a is provided on the other side of the magnetic assembly 40 on the shoulder 57a at the lower end of the void 26, and each of the ring shaped carriers 56 and 56a is rotatable on its respective shoulder 57 and 57a to enable the means designated generally at 60 to be aligned axially relative to the original orientation of the device 12 on the lower end of the well string. The device 60 is shown as comprising the electric eye or photoelectric cell 61 which is supported in the carrier ring 56 and its component or light source 61a which is carried in the carrier ring 56a on the other side of the magnetic assembly 40.

A suitable power source 65 is provided for the cell 61 and light source 61a, and it will be noted that a circular contact 66 is provided on the bottom of the ring 56a whereby power may be supplied to the component 61a regardless of its circumferential position in relation to the battery 65. In the form of the invention shown, the component 61a represents an illumination source such as

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an incandescent bulb which functions in a well known manner for the actuation of the electric eye or photoelectric cell 61 in the ring carrier or support 56, as will be described in greater detail hereinafter.

The electric eye or photoelectric cell is electrically connected as schematically represented at 67 in the drawings to the battery 65 and to a signalling device 68 so that actuation of the electric eye 61 by light striking thereagainst from the component 61a actuates the signalling device to create a signal which can be transmitted to the earth's surface from the well string and there picked up by a suitable receiver.

In the assembly and use of the present invention, the power source such as the battery 65 will be positioned in the opening 65' provided therefor in the body 20, which opening 65' communicates at one end with the void 26.

The lower portion 21 of the body 20 is threaded into the well string 8 above the bit 16 and deflecting device 12. The device 12, bit 16 and well string 8 thereabove are suspended in the derrick 4 while the body portion 21 is connected therewith.

Similarly the signalling device will be positioned in the passage or opening 68' which also communicates with the void 26 in the body 20 as illustrated in the drawings. The signalling device 68 may comprise an electromagnet the core of which is provided with a rod, and longitudinal movement of the rod in the core of the electromagnet in response to alignment of slot 50, light 61a and cell 61, as will be described in greater detail herein, creates a sound or vibration, which is transmitted to the earth's surface through the well string 8. The rod may strike some portion of the body 20, or a sounding mechanism provided in the body against which the rod moves upon longitudinal movement.

Regardless of the form of the signalling device, it is positioned in the opening 68' and is electrically connected with the photoelectric cell or electric eye 61 by means of the lead 67 as schematically illustrated in dotted line in FIG. 2 of the drawings. The component 61a and its ring carrier 56a are then inserted in the void 26 and telescopically moved over the annular wall portion 28 of the body 20, so as to seat on the ledge or shoulder 57a at the bottom of the void 26. The component 61a is then rotated within the body 20 until the light or illuminating source 61 is axially aligned with the face 17 of the device 12 on the well string 8 to be oriented.

This may be accomplished by placing a mark longitudinally on the well string immediately below the device 9, but in axial alignment with the face 17 of the device 12 when it is hanging in the derrick prior to lowering it in the well bore. This enables the apparatus to be assembled so that the illuminating source 61a is visually and axially aligned with the face 17. As shown in FIG. 2, suitable seal means 61c are provided on the carrier 56a for forming a seal therewith to inhibit the loss of the liquid from the void 26. The liquid 26 forms a support for the magnetic assembly 40 and enables the permanent magnet 41 to align the magnetic assembly 40 with magnetic North when inserted in void 26. Since the assembly 40 floats in, or on the liquid 27, it may assume various relationships relative to the body 20, depending upon whether or not the well bore 6 slopes or is inclined at its lower end. As illustrated in FIG. 2 of the drawings the assembly 40 is shown in the position it will assume after the deflected portion 18 of the well bore has been drilled for a short distance.

Prior to the time that the assembly 40 is positioned in the void 26, the radial slot 50 of the cover 43 is adjusted to the indication on the carrier 42 the direction in which it is desired to face or orient the guide surface 17 of the device 12. The carrier 42 for the magnets 41 has indicated thereon true magnetic North, East, South, and West, as well as angular distances therebetween. This is schematically illustrated in FIG. 4 wherein the direction of true magnetic North is shown at 70, East at 71, South

at 72 and West at 73, with the angular representations being indicated generally at 74 on the top 46 and inside edge 46' of carrier 42.

In FIG. 3, true magnetic North on the carrier 42 is at 70, with East being indicated at 71. It will be noted that the radial slot 50 is illustrated in FIG. 3 and in FIG. 4 as being adjusted so that its direction is North, 20° East. This represents the direction in which it is desired to orient the face 17 of the device 12 so as to drill the deflected portion 18 of the well bore 8.

After the radial slot has been adjusted relative to the magnet 41 so that the slot 50 indicates the direction in which it is desired to orient the device in the bottom of the well bore, the assembly 40 is then positioned on the liquid in the void 26. Thereafter, the ring 56 and photoelectric cell or electric eye 61 are seated on the shoulder or ledge 57 and rotated so as to axially align the electric eye 61 with the original direction of the guide surface 17. When thus aligned, the electric eye 61 and the illumination source 61a will be aligned axially relative to each other and axially with the face 17 of the device 12. In order to secure the electric eye 61 in this position, suitable means such as the snap lock ring 76 are provided which fits in the groove 77 and abuts the top of the carrier 56. Thereafter, the lock means, shown as being a lock nut 78, may be threaded against the snap ring 76 to hold the electric eye in position. Suitable seals as shown at 56b are provided for inhibiting the passage of fluid into the void 26 or the escape of liquid therefrom.

The portion 22 of the body 20 is then threaded on the threads 23 whereupon the next adjacent section of the well string 8 is adapted to be secured in position on the upper end of non-magnetic section 22.

The apparatus is then ready to be lowered into the well bore and used to orient the device 12 on the lower end of the well string 8.

When the device to be oriented, shown in the drawings as being a whipstock, rests on the bottom of the well bore, it may not initially face in the desired direction. In order to face the whipstock in the desired direction so that the bit 16 on the lower end of the well string 8 will in turn be guided in the desired direction, the well string 8 will be slowly rotated, and since the body 20 comprising the portions 21, and 22 are formed of non-magnetic material slow rotation of the drill string 8 causes the body 20 to rotate relative to the assembly 40, since the compass assembly 40 includes the permanent magnets 41.

Continued rotation of the well string 8 and body 20 connected therewith will eventually axially align the radial slot 50 of cover 43 with the face 17 of the device 12. When this occurs light from the illumination source 61a passes through the slot 50 and the cover 43 and actuates the electric eye or photoelectric cell 61 in a well known manner so that the signalling device 68 in turn is actuated.

So long as the slot 50 is aligned with the face 17 of the device 12, the electric eye 61 will function to actuate the signal means 68 which in turn notifies the driller at the top of the well bore that the device to be oriented is facing in the desired direction and the deflected bore 18 can then be drilled.

In some situations, the face 17 of the device 12 will not be positioned in the same direction in which the portion 18 is to be drilled. For example, it may be desired to actually drill the portion 18 in the last example so that it is North, 5° East, but because of "drift" in the well string, it is necessary to set the device 12 so that it falls 15° to the East to offset the drift of the drill string.

It can be appreciated that other suitable forms of signalling could be utilized such as a valve member which would actuate to temporarily restrict the bore 24 thereby indicating at the earth's surface that the device had been oriented, or some other suitable form of signalling means.

It is to be further noted that the device as above described enables the orientation to be effected without regard to the direction in which the well bore has been proceeding. The magnetic assembly 40 incorporates an

indication means which indicates the direction in which the device is to be oriented, which means is the slotted cover 43. It also incorporates an indication means which indicates the direction in which the device 12 originally faces when it is initially secured in the drill string, which means is the cell 61 and light 61a. Thus, alignment of these two means signifies that the face 17 of the orienting device 12 has been aligned in the direction in which it is desired to drill the well bore 8; this in turn actuates the signalling device 68 in the manner as previously described.

Where a drill bit having means incorporated therein, such as jets, is the orienting device which is to be oriented on the bottom of the well bore, the function of the present invention is the same as that above described. However, in this event the present invention would function to serve as a means to enable the device to be re-oriented while in the well bore. Therefore, if the rotation of the drill string is temporarily stopped, to enable the magnet 41 to come to rest in alignment with 61 and 61a, signals from means 68 picked up at the earth's surface would serve as an indication that the jet bit is re-oriented, and the deflection of the jet bit could then be repeated. However, if such signals are not picked up, then the operation of slowly rotating the drill string 8 while maintaining pump pressure, if desired, whereupon the bit 16 is moved in the desired direction so that drilling may then be continued. The jet bit could be re-oriented in this described manner as many times as necessary without even removing the well string from the well bore, or without lowering survey instruments in the well bore.

Additionally, the orientation of the device on the lower end of the well string is accomplished while circulating drilling fluid through the well string, thereby inhibiting the possibility of sticking of the well string in the well bore.

The present invention has been described in detail in its application in a well string for orienting a device such as a whipstock or jet bit. However, it can be used to orient any tool in a well bore such as a packer, sampler tool and any other device.

Broadly the present invention relates to apparatus for orienting a device on the lower end of a well string in a well bore, and more particularly to an apparatus which enables a device to be oriented at the bottom of the well bore without repeated lowering of a survey instrument through the well string to ascertain when the device is oriented.

What is claimed is:

1. An apparatus for orienting a device on a well string including,
 - (a) a sub formed of nonmagnetic material adapted to be secured in the well string,
 - (b) there being a longitudinal bore through said sub for circulating through said sub,
 - (c) there being a void in said sub spaced from, but surrounding said bore,
 - (d) a magnetic assembly for floating on a liquid in said void,
 - (e) a nonmagnetic, slotted cover rotatably positioned on said assembly whereby said slotted cover may be rotated to indicate the desired orientation of the device on the well string,
 - (f) a photoelectric cell supported in said sub in alignment relative to the device to be oriented on the well string,
 - (g) a power source for said cell,
 - (h) and a signaling device electrically connected to said cell whereby rotation of the well string relative to said floating magnetic assembly effects alignment of said slotted cover with said cell to thereby actuate said signaling device as an indication that the device on the well string has been oriented to its desired position.
2. An apparatus for orienting a device on the lower end of a well string in a predetermined direction in a well bore including,

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- (a) a body of nonmagnetic material secured in the drill string adjacent the lower end thereof,
 - (b) means carried by said body in alignment relative to the device to be oriented,
 - (c) a magnetic assembly carried by said body,
 - (d) means mounted on said assembly and having a portion thereof to indicate the direction in which it is desired to orient the device,
 - (e) a signal means responsive when said portion is aligned with said means carried by said body in alignment relative to the device to be oriented to signal such alignment as an indication of the desired orientation,
 - (f) said means carried by said body in alignment relative to the device to be oriented including, (1) a photoelectric cell, (2) a support therefor rotatably mounted in said body whereby said cell may be aligned with the device to be oriented, and (3) a lock ring for securing said cell and support in said aligned position in said body,
 - (g) and said magnetic assembly including, (1) a permanent magnet and (2) a support for said permanent magnet of transparent material and adapted for floating on a liquid within said body whereby said body may be rotated relative to said floating assembly in said body to thereby align said cell and said portion on said assembly.
3. Apparatus for orienting a device on the lower end of a well string in a well bore including,
- (a) a body of nonmagnetic material for securing in the well string,
 - (b) there being a longitudinal bore therethrough for circulating through said body,
 - (c) there being a void in said body for receiving a liquid therein,
 - (d) a magnetic assembly for floating in a liquid in said void,
 - (e) said assembly including means movably positioned thereon for indicating on said assembly the direction in which the device is to be oriented,
 - (f) means in said body for indicating the initial direction in which the device is oriented when it is connected in the well string,
 - (g) means for creating a signal when the well string is rotated to align said means indicating the initial direction of the device with the direction indicated on said assembly in which the device is to be oriented as an indication that the device is oriented,
 - (h) said instrument for indicating the initial direction of the device being a photoelectric cell longitudinally spaced from said magnetic assembly on each side thereof,
 - (i) and wherein said means positioned on said assembly for indicating the direction in which the device is to be oriented transmits light therethrough whereby alignment of said cell and said means actuates said signal means electrically connected therewith.
4. Apparatus for orienting a device in a well bore on the lower end of a well string comprising,
- (a) a body of nonmagnetic material for securing in the well string,
 - (b) there being a longitudinal bore therethrough for circulating through said body,

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- (c) there being a longitudinally extending, axially aligned, ring shaped void in said body surrounding, but spaced from said bore for receiving a liquid therein,
 - (d) a magnetic assembly for floating on the liquid in said void,
 - (e) said assembly including, (1) a permanent magnet, (2) a transparent, nonmagnetic ring shaped support therefor, (3) a nonmagnetic cover circumferentially slidable on said transparent support, (4) there being a radial slot in said cover, (5) a ring shaped carrier in said void, and (6) instrument means on said carrier for axial alignment with the device when it is secured on the lower end of the well string,
 - (f) lock ring means engaging said carrier for retaining said instrument in position axially aligned with the device to be oriented,
 - (g) said cover slidable on said transparent support to move said slot to indicate the direction in which the device is to be oriented,
 - (h) said magnet retaining a predetermined azimuthal position when the well string is rotated,
 - (i) and means for creating a signal when the device is oriented in alignment with said slot in said cover as an indication that the device has been oriented to the desired direction.
5. The combination recited in claim 4 wherein said instrument means for indicating the initial direction of the device is a photoelectric cell and positioned on each side of said magnetic assembly, and wherein said cell is electrically connected with said signal creating means whereupon said cell actuates said signal means when said slot is aligned with said cell.
6. Apparatus for orienting a device in a well bore including,
- (a) a body of nonmagnetic material for lowering into the well bore,
 - (b) there being a longitudinal bore therethrough for circulating through said body,
 - (c) there being a void in said body,
 - (d) a magnetic assembly for floating on a liquid in said void, said assembly including, (1) means movably positioned thereon for indicating on said assembly the direction in which the device is to be oriented,
 - (e) means in said body for indicating the initial direction in which the device is oriented when it is lowered into the well bore,
 - (f) and means for creating a signal when said body is rotated to align said means indicating the initial direction of the device with the direction indicated on said assembly in which the device is to be oriented as an indication that the device is oriented.

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