

[SS 1] grounding and arrangement

Results in EPODOC 2.200

[SS 2] surface and exitation

Results in EPODOC 32

[SS 3] 1 and 2

Results in EPODOC 0

[SS 4] drill or drilling

Results in EPODOC 341.089

[SS 5] 4 and grounding

Results in EPODOC 342

[SS 6] 5 and electromagnetic

Results in EPODOC 31

[SS 7] 6 and impedance

Results in EPODOC 10

[SS 8] ..li



PN - [US2018045034](#) A1 20180215
PR - WO2015US22518 20150325
AP - US201515555931 20150325
DT - **
CCI - [E21B47/02216](#) ; [E21B7/04](#)
PA - HALLIBURTON ENERGY SERVICES INC [US]
TI - Surface Excitation Ranging Methods and Systems Employing a Ground Well and a Supplemental **Grounding** Arrangement
AB - A surface excitation ranging method includes selecting a first well with a metal casing as a target well and selecting a second well with a metal casing as a ground well. The method also includes installing a supplemental **grounding** arrangement for a power supply located at earth's surface, wherein the ground well and the supplemental **grounding** arrangement fulfill an **impedance** criteria or ranging performance criteria. The method also includes conveying an electrical current output from the power supply along the target well. The method also includes sensing **electromagnetic** (EM) fields emitted from the target well due to the electrical current. The method also includes using distance or direction information obtained from the sensed EM fields to guide **drilling** of a new well relative to the target well.

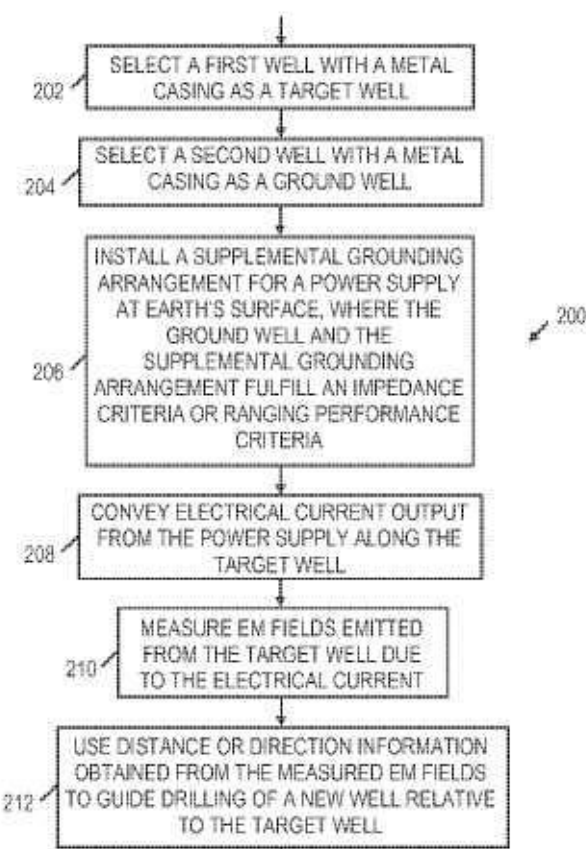


FIG. 6

PN - [US2018038219](#) A1 20180208

PR - WO2015US22536 20150325

AP - US201515553111 20150325

DT - **

CCI - [E21B47/02216](#) ; [G01V3/30](#)

CUI - [E21B47/024](#) ; [E21B47/09](#) ; [G01V3/26](#)

CUA - [G01V3/083](#)

PA - HALLIBURTON ENERGY SERVICES INC [US]

TI - Surface Excitation Ranging Methods and Systems Employing a Customized **Grounding** Arrangement

AB - A surface excitation ranging method includes installing a customized **grounding** arrangement for a power supply located at earth's surface, wherein the customized **grounding** arrangement fulfills an **impedance** criteria or ranging performance criteria. The method also includes conveying an electrical current output from the power supply along a target well with a metal casing. The method also includes sensing **electromagnetic** (EM) fields emitted from the target well due to the electrical current. The method also includes using distance or direction information obtained from the sensed EM fields to guide **drilling** of a new well relative to the target well.

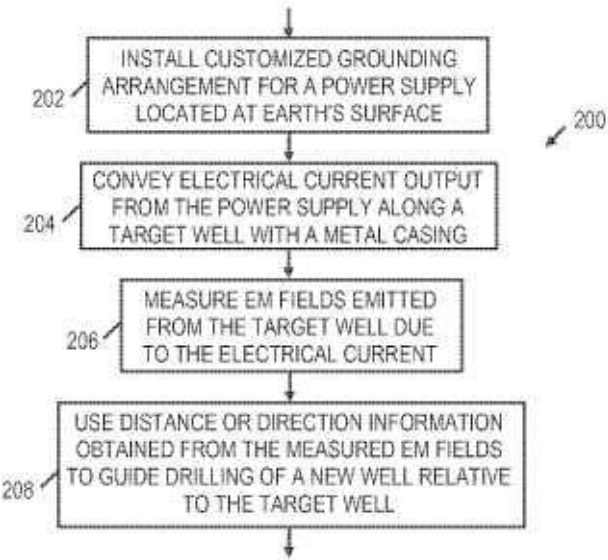


FIG. 6

PN - [MX2017010185](#) A 20171117
PR - WO2015US22518 20150325
AP - MX20170010185 20150325
DT - I
CCI - [E21B47/02216](#) ; [E21B7/04](#)
PA - HALLIBURTON ENERGY SERVICES INC [US]
TI - SURFACE EXCITATION RANGING METHODS AND SYSTEMS EMPLOYING A GROUND WELL AND A SUPPLEMENTAL **GROUNDING** ARRANGEMENT.
AB - A surface excitation ranging method includes selecting a first well with a metal casing as a target well and selecting a second well with a metal casing as a ground well. The method also includes installing a supplemental **grounding** arrangement for a power supply located at earth's surface, wherein the ground well and the supplemental **grounding** arrangement fulfill an **impedance** criteria or ranging performance criteria. The method also includes conveying an electrical current output from the power supply along the target well. The method also includes sensing **electromagnetic** (EM) fields emitted from the target well due to the electrical current. The method also includes using distance or direction information obtained from the sensed EM fields to guide **drilling** of a new well relative to the target well.

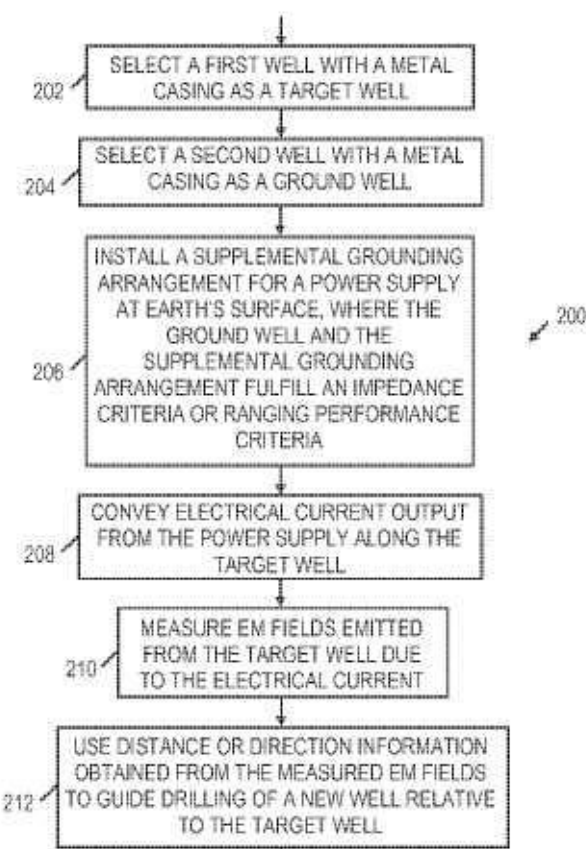


FIG. 6

PN - [MX2017010190](#) A 20171117
PR - WO2015US22536 20150325
AP - MX20170010190 20150325
DT - I
CCI - [E21B47/02216](#) ; [G01V3/30](#)
CUI - [E21B47/024](#) ; [E21B47/09](#) ;
[G01V3/26](#)
CUA - [G01V3/083](#)
PA - HALLIBURTON ENERGY SERVICES
INC [US]
TI - SURFACE EXCITATION RANGING
METHODS AND SYSTEMS
EMPLOYING A
CUSTOMIZED **GROUNDING**
ARRANGEMENT.
AB - A surface excitation ranging
method includes installing a
customized **grounding**
arrangement for a power supply
located at earth's surface,
wherein the
customized **grounding**
arrangement fulfills
an **impedance** criteria or ranging
performance criteria. The
method also includes conveying
an electrical current output from
the power supply along a target
well with a metal casing. The
method also includes
sensing **electromagnetic** (EM)
fields emitted from the target
well due to the electrical current.
The method also includes using
distance or direction
information obtained from the
sensed EM fields to guide **drilling**
of a new well relative to the
target well.

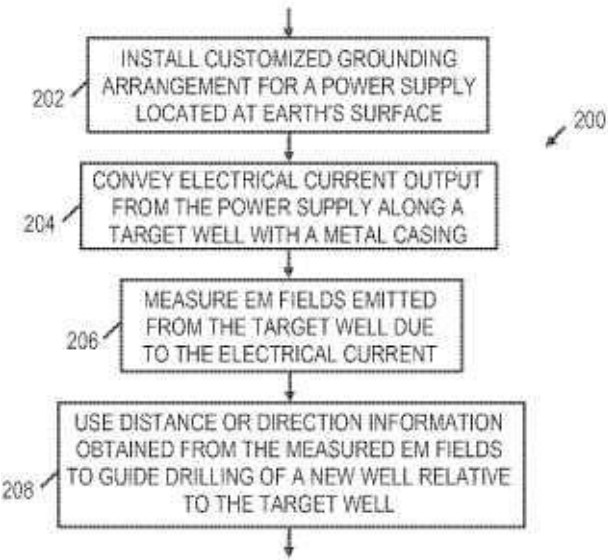


FIG. 6

PN - [CA2977216](#) A1 20160929
PR - WO2015US22518 20150325
AP - CA20152977216 20150325
DT - I
CCI - [E21B47/02216](#) ; [E21B7/04](#)
PA - HALLIBURTON ENERGY SERVICES INC [US]
TI - SURFACE EXCITATION RANGING METHODS AND SYSTEMS EMPLOYING A GROUND WELL AND A SUPPLEMENTAL **GROUNDING** ARRANGEMENT
AB - A surface excitation ranging method includes selecting a first well with a metal casing as a target well and selecting a second well with a metal casing as a ground well. The method also includes installing a supplemental **grounding** arrangement for a power supply located at earth's surface, wherein the ground well and the supplemental **grounding** arrangement fulfill an **impedance** criteria or ranging performance criteria. The method also includes conveying an electrical current output from the power supply along the target well. The method also includes sensing **electromagnetic** (EM) fields emitted from the target well due to the electrical current. The method also includes using distance or direction information obtained from the sensed EM fields to guide **drilling** of a new well relative to the target well.

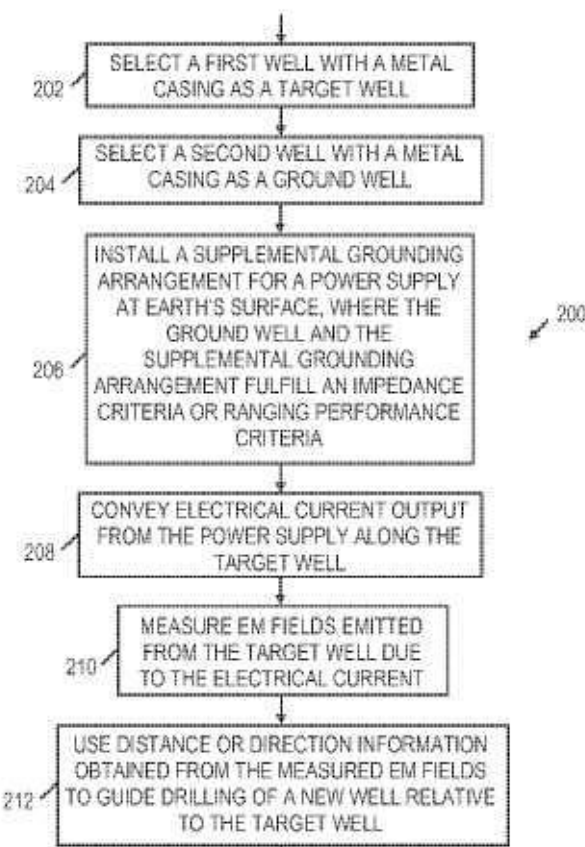


FIG. 6

PN - [CA2976352](#) A1 20160929

PR - WO2015US22536 20150325

AP - CA20152976352 20150325

DT - I

CCI - [E21B47/02216](#) ; [G01V3/30](#)

CUI - [E21B47/024](#) ; [E21B47/09](#) ; [G01V3/26](#)

CUA - [G01V3/083](#)

PA - HALLIBURTON ENERGY SERVICES INC [US]

TI - SURFACE EXCITATION RANGING METHODS AND SYSTEMS EMPLOYING A CUSTOMIZED **GROUNDING** ARRANGEMENT

AB - A surface excitation ranging method includes installing a customized **grounding** arrangement for a power supply located at earth's surface, wherein the customized **grounding** arrangement fulfills an **impedance** criteria or ranging performance criteria. The method also includes conveying an electrical current output from the power supply along a target well with a metal casing. The method also includes sensing **electromagnetic** (EM) fields emitted from the target well due to the electrical current. The method also includes using distance or direction information obtained from the sensed EM fields to guide **drilling** of a new well relative to the target well.

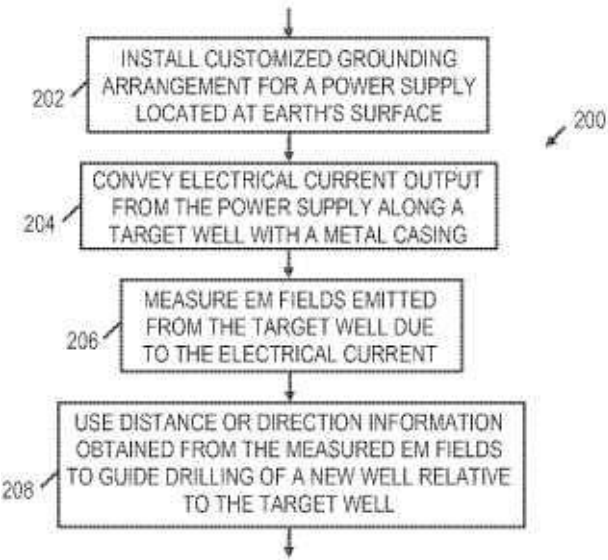


FIG. 6

PN - [AU2015387499](#) A1 20170831

PR - WO2015US22536 20150325

AP - AU20150387499 20150325

DT - I

CCI - [E21B47/02216](#) ; [G01V3/30](#)

CUI - [E21B47/024](#) ; [E21B47/09](#) ; [G01V3/26](#)

CUA - [G01V3/083](#)

PA - HALLIBURTON ENERGY SERV INC

TI - Surface excitation ranging methods and systems employing a customized **grounding** arrangement

AB - A surface excitation ranging method includes installing a customized **grounding** arrangement for a power supply located at earth's surface, wherein the customized **grounding** arrangement fulfills an **impedance** criteria or ranging performance criteria. The method also includes conveying an electrical current output from the power supply along a target well with a metal casing. The method also includes sensing **electromagnetic** (EM) fields emitted from the target well due to the electrical current. The method also includes using distance or direction information obtained from the sensed EM fields to guide **drilling** of a new well relative to the target well.

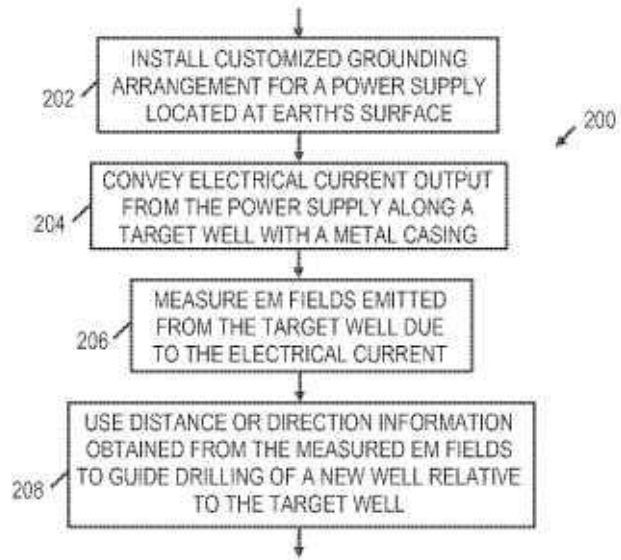


FIG. 6

PN - [AU2015387496](#) A1 20170817
PR - WO2015US22518 20150325
AP - AU20150387496 20150325
DT - I
CCI - [E21B47/02216](#) ; [E21B7/04](#)
PA - HALLIBURTON ENERGY SERV INC
TI - Surface excitation ranging methods and systems employing a ground well and a supplemental **grounding** arrangement
AB - A surface excitation ranging method includes selecting a first well with a metal casing as a target well and selecting a second well with a metal casing as a ground well. The method also includes installing a supplemental **grounding** arrangement for a power supply located at earth's surface, wherein the ground well and the supplemental **grounding** arrangement fulfill an **impedance** criteria or ranging performance criteria. The method also includes conveying an electrical current output from the power supply along the target well. The method also includes sensing **electromagnetic** (EM) fields emitted from the target well due to the electrical current. The method also includes using distance or direction information obtained from the sensed EM fields to guide **drilling** of a new well relative to the target well.

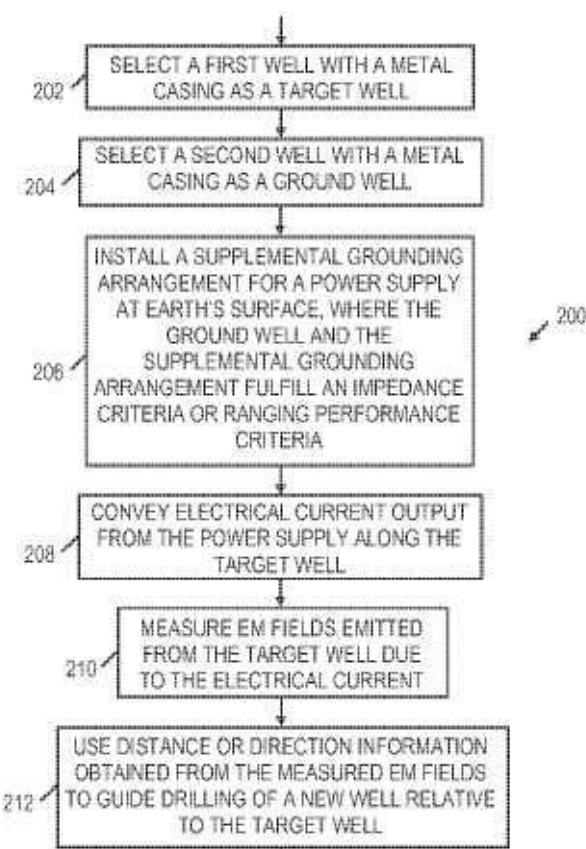


FIG. 6

PN

- [WO2016153504](#) A1 20160929

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- WO2015US22518 20150325

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- WO2015US22518 20150325

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- |KR| ISR (A1)

[US5218301](#) A 19930608

[XY] (KUCKES ARTHUR F [US])

[X] 1-8, 11-19

* See column 5, lines 40-64, column 6, line 31-column 7, line 28 and figure 1. *

[Y] 9-10, 20;

[US2012326723](#) A1 20121227

[Y] (BLOEMENKAMP RICHARD [FR], et al)

[Y] 9-10, 20

* See abstract and claim 1. *;

[US2007278008](#) A1 20071206

[A] (KUCKES ARTHUR F [US], et al)

[A] 1-20

* See paragraphs [0024]-[0058] and figures 1-10. *;

[US5343152](#) A 19940830

[A] (KUCKES ARTHUR F [US])

[A] 1-20

* See column 6, line 65-column 11, line 39 and figure 1. *;

[US7812610](#) B2 20101012

[A] (CLARK BRIAN [US], et al)

[A] 1-20

* See column 3, line 18-column 16, line 67 and figures 1-15. *

CCI

- [E21B47/02216](#) ; [E21B7/04](#)

PA

- HALLIBURTON ENERGY SERVICES INC [US]

TI

- SURFACE EXCITATION RANGING METHODS AND SYSTEMS EMPLOYING A GROUND WELL AND A SUPPLEMENTAL **GROUNDING** ARRANGEMENT

AB

- A surface excitation ranging method includes selecting a first well with a metal casing as a target well and selecting a second well with a metal casing as a ground well. The method also includes installing a supplemental **grounding** arrangement for a power supply located at earth's surface, wherein the ground well and the supplemental **grounding** arrangement fulfill an **impedance** criteria or ranging performance criteria. The method also includes conveying an electrical current output from the power supply along the target well. The

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graph TD
    202[SELECT A FIRST WELL WITH A METAL CASING AS A TARGET WELL] --> 204[SELECT A SECOND WELL WITH A METAL CASING AS A GROUND WELL]
    204 --> 206[INSTALL A SUPPLEMENTAL GROUNDING ARRANGEMENT FOR A POWER SUPPLY AT EARTH'S SURFACE, WHERE THE GROUND WELL AND THE SUPPLEMENTAL GROUNDING ARRANGEMENT FULFILL AN IMPEDANCE CRITERIA OR RANGING PERFORMANCE CRITERIA]
    206 --> 208[CONVEY ELECTRICAL CURRENT OUTPUT FROM THE POWER SUPPLY ALONG THE TARGET WELL]
    208 --> 210[MEASURE EM FIELDS EMITTED FROM THE TARGET WELL DUE TO THE ELECTRICAL CURRENT]
    210 --> 212[USE DISTANCE OR DIRECTION INFORMATION OBTAINED FROM THE MEASURED EM FIELDS TO GUIDE DRILLING OF A NEW WELL RELATIVE TO THE TARGET WELL]
  
```

FIG. 6

method also includes sensing **electromagnetic** (EM) fields emitted from the target well due to the electrical current. The method also includes using distance or direction information obtained from the sensed EM fields to guide **drilling** of a new well relative to the target well.

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PN

- [WO2016153507](#) A1 20160929

PNFP

- WO2016153507 A8 20170831

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- WO2015US22536 20150325

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- WO2015US22536 20150325

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- *; Rep

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- |KR| ISR (A1)
[US5218301](#) A 19930608
[XY] (KUCKES ARTHUR F [US])
[X] 1-8, 11-19
* See column 5, lines 40-64, column 6, line 31-column 7, line 28 and figure 1. *
[Y] 9-10, 20;
[US2012326723](#) A1 20121227
[Y] (BLOEMENKAMP RICHARD [FR], et al)
[Y] 9-10, 20
* See abstract and claim 1. *;
[US2007278008](#) A1 20071206
[A] (KUCKES ARTHUR F [US], et al)
[A] 1-20
* See paragraphs [0024]-[0058] and figures 1-10. *;
[US5343152](#) A 19940830
[A] (KUCKES ARTHUR F [US])
[A] 1-20
* See column 6, line 65-column 11, line 39 and figure 1. *;
[US7812610](#) B2 20101012
[A] (CLARK BRIAN [US], et al)
[A] 1-20
* See column 3, line 18-column 16, line 67 and figures 1-15. *

CCI

- [E21B47/02216](#) ; [G01V3/30](#)

CUI

- [E21B47/024](#) ; [E21B47/09](#) ; [G01V3/26](#)

CUA

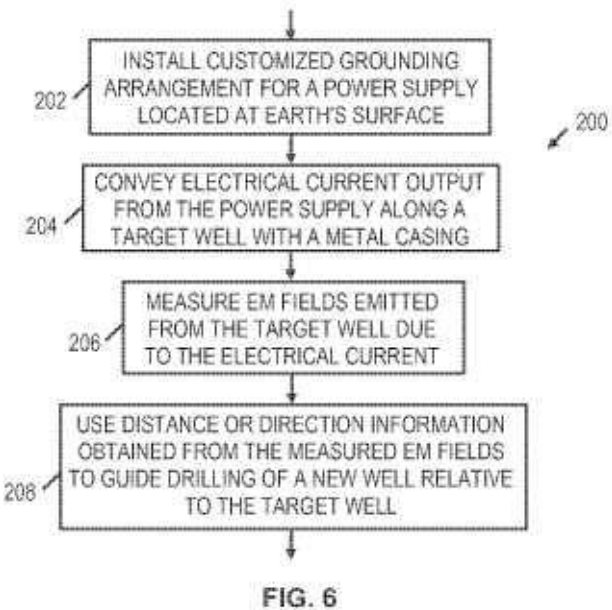
- [G01V3/083](#)

PA

- (A1)
HALLIBURTON ENERGY SERV INC [US]
- (A8)
HALLIBURTON ENERGY SERVICES INC [US]

TI

- (A1 A8)
SURFACE EXCITATION RANGING METHODS AND SYSTEMS



EMPLOYING A
CUSTOMIZED **GROUNDING**
ARRANGEMENT

AB

- (A1 A8)
A surface excitation ranging method includes installing a customized **grounding** arrangement for a power supply located at earth's surface, wherein the customized **grounding** arrangement fulfills an **impedance** criteria or ranging performance criteria. The method also includes conveying an electrical current output from the power supply along a target well with a metal casing. The method also includes sensing **electromagnetic** (EM) fields emitted from the target well due to the electrical current. The method also includes using distance or direction information obtained from the sensed EM fields to guide **drilling** of a new well relative to the target well.