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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/549,519	12/13/2021	Terry Treiberg	CHX.1002US	4428

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EXAMINER	
SINGLETARY, MICHAEL J	

ART UNIT	PAPER NUMBER
2863	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 17/549,519	Applicant(s) Treiberg et al.	
	Examiner MICHAEL J SINGLETARY	Art Unit 2863	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 09/17/2024.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-20 is/are pending in the application.
5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-20 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a)☐ All b)☐ Some** c)☐ None of the:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ______.

3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ______.

4) ☐ Other: ______.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Arguments

Applicant's arguments filed 09/17/2024 have been fully considered but they are not persuasive. Applicant discloses that Phillips does not describe a "***magnetometer*** to be coupled to the at least one component of the downhole pumping system and to ***measure axial movement*** of the at least one component of the downhole pumping system based on variations in a magnet field detected by the magnetometer" as recited in claim 1. The examiner respectfully disagrees. Paragraph [0094] discloses "FIG. 3 illustrates a generic multi-axis sensing device 301. In one aspect, the device 301 is a magnetometer and the field 302 is the earth's magnetic field." It is further disclosed in detail in paragraphs [0094-0099, 0122-0123].

Further, Applicant discloses that Phillips does not disclose "determining rotational velocity of the at least one component of the downhole pumping system with the rotation sensor subsystem ***by sampling rotational velocity values*** generated by the rotation of the at least one component of the downhole pumping system ***with only the gyroscope***," as further recited in amended claim 1. Examiner respectfully disagrees.

The reference clearly states that "the sensing components may comprise a magnetometer, accelerometer **and/or a gyroscope [0043]**. In this instance, the accelerometer and gyroscope are configured to determine immediate rotational deflection of the bridle assembly during the course of a single stroke by way of an inertial reference. A 3-axis gyroscope is similar to a 3-axis accelerometer, except the frame of reference is a static inertial frame. As a result, the indicated field lines 302 would not necessarily have a meaning at rest in the context of a gyroscope as the magnitude and direction of the gyroscope reading measures the change in inertia of the sensor [0096]." Lastly, applicant discloses that Phillips does not describe "a ***vibration sensor*** subsystem for monitoring vibration of the at least one component of the downhole pumping system ***in three axes***," or deriving "a ***vibrational baseline*** of the at least one component of the downhole pumping system from the vibration sensor subsystem ***in three axes*** during normal operation." This argument is moot because claims have been amended. Examiner has therefore, added an additional reference that teaches to this limitation. It is for these reasons, the examiner maintains the rejections.

Claim Rejections - 35 USC § 102

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis (i.e., changing from AIA to pre-AIA) for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention.

Claims 1-7 and 13-15 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Phillips (US20190203579A1, 2019-07-04).

Regarding Claim 1, Phillips teaches a sensor system for a downhole pumping system [0019], comprising: a sensor subsystem for detecting movement of at least one component of the downhole pumping system [Claim 1], the sensor subsystem comprising:

an axial motion sensor subsystem comprising a magnetometer, the magnetometer to be coupled to the at least one component of the downhole pumping system and to measure axial movement of the at least one component of the downhole pumping system based on variations in a magnet field detected by the magnetometer generated by movement of the at least one component of the downhole pumping system (Claim 1; [00126]); and

a rotation sensor subsystem comprising a gyroscope, the gyroscope to be coupled to the at least one component of the downhole pumping system and to detect rotational movement of the at least one component of the downhole pumping system by detecting rotational velocity values with the gyroscope generated by rotation of the at least one component of the downhole pumping system [Claim 1 and 12; [00110]); and a processor subsystem to receive data from the axial motion sensor subsystem and the rotation sensor subsystem [Claim 1], the processor subsystem to: measure axial movement of the at least one component of the downhole pumping system with the magnetometer of the axial motion sensor subsystem [0021]; and

determine rotational velocity of the at least one component of the downhole pumping system with the rotation sensor subsystem by sampling rotational velocity values generated by the rotation of the at least one component of the downhole pumping system with only the gyroscope [0026; 0029; 0043; 0096; 0134; 0138; Fig. 6].

Regarding Claim 2, Phillips further teaches the sensor system of claim 1, wherein the sensor subsystem is configured to detect movement of the at least one component of the downhole pumping system comprising at least one rod of the downhole pumping system extending from a surface location into a wellbore [Claim 1 and 13].

Regarding Claim 3, Phillips further teaches the sensor system of claim 2, wherein the processor subsystem is configured to verify the axial movement of the at least one rod before determining the rotation [0027; 00134; Claim 11; Fig. 6].

Regarding Claim 4, Phillips further teaches the sensor system of claim 2, wherein the processor subsystem is configured to determine a change in direction the at least one rod [0021-0022].

Regarding Claim 5, Phillips further teaches the sensor system of claim 4, wherein the processor subsystem is configured to begin sampling the rotational velocity after determining the change in direction the at least one rod [0110].

Regarding Claim 6, Phillips further teaches the sensor system of claim 5, wherein the processor subsystem is configured to continue sampling the rotational velocity until another change in direction the at least one rod is detected [0158].

Regarding Claim 7, Phillips further teaches the sensor system of claim 5, wherein the processor subsystem is configured to continue sampling the rotational velocity along substantially an entire stroke of the at least one rod, the sampling beginning at a first change of direction of the at least one rod, continuing through a second change of direction of the at least one rod, and ceasing at a third change of direction of the at least one rod [0029; 0110].

Regarding Claim 19, Phillips teaches a method of detecting motion of at least one component of a downhole pumping system, the method comprising: detecting axial movement of at least one component of the downhole pumping system based on variations detected by an axial motion sensor coupled to the at least one component of the downhole pumping system generated by translation of the at least one component of the downhole pumping system [0077]; detecting rotational movement of the at least one component of the downhole pumping system with a rotational sensor generated by rotation of the at least one component of the downhole pumping system ([Claim 1 and

12; [00110]); and verifying axial movement of the at least one component of the downhole pumping system with the axial motion sensor before the detecting of the rotational movement of the at least one component of the downhole pumping system with the rotational sensor [0027; 00134; Claim 11; Fig. 6].

Regarding Claim 20, The method of claim 19, further comprising comparing a rotational velocity detected with the rotational sensor with a threshold value to determine a performance characteristic of the at least one component of the downhole pumping system [0026; 0158; Claim 9].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 10 and 11 are rejected under 35 U.S.C. 103 as being unpatentable over Phillips (US 20190203579A1, 04-07-2019).

Regarding Claim 10, Phillips teaches the sensor system of claim 1, wherein the processor subsystem is configured to determine the rotational velocity of the at least one component of the downhole pumping system by summing both positive and negative samples of the rotational velocity values sensed by the rotation sensor subsystem [0029; 0110; 0115].

Although Phillips does not specifically disclose the summing both positive and negative samples of the rotational velocity values, acceleration is the rate of change of velocity over time, and velocity is the rate of change of position over time.

Therefore, it would have been obvious to a person of ordinary skill in the art that determining rotational velocity by summing both positive and negative samples, was previously taught by Phillips.

Regarding Claim 11, Phillips further teaches the sensor system of claim 10, wherein the processor subsystem is configured to compare the determined rotational velocity of the at least one component of the downhole pumping system with an expected amount of rotational velocity to determine a failure in the rotation of the at least one component of the downhole pumping system [Claim 1; Claim 10].

Claims 8, 9, and 16-18 are rejected under 35 U.S.C. 103 as being unpatentable over Phillips, in view of Hurst et al. (US9140113B2, 2015-09-22), herein referred to as Hurst.

Regarding Claim 8, Phillips teaches all of the limitations of Claim 1. Phillips further teaches wherein the sensor subsystem is configured to detect movement of the at least one component of the downhole pumping system (abstract).

Phillips fails to specifically mention a tubing rotator, he does mention tubing that surrounds the rod string (which is well known in the art as a tubular rotator (Hurst Col. 3, lines 42-49).

However, in a related field, Hurst teaches wherein monitoring is performed by a mechanism incorporated in at least one of a load cell, a rod rotator, or a tubing rotator (Claim 2).

Therefore, it would have been obvious to a person of ordinary skill in the art prior to the effective filing date of the claimed invention to have modified Phillips to incorporate the teachings of Hurst by including: a tubing rotator in order to distribute wear.

Regarding Claim 9, the combination further teaches the sensor system of claim 8, wherein the sensor subsystem is configured to detect rotation of the tubing rotator while detecting axial movement of a polished of the downhole pumping system (Phillips: Claim 1, Fig. 6).

Regarding Claim 16, Phillips teaches a sensor system for a downhole pumping system, comprising:

an axial motion sensor subsystem comprising a magnetometer to measure axial movement of at least one component of the downhole pumping system and to determine a change in axial direction of the at least one component of the downhole pumping system [0095-0099; 0081].

a sensor subsystem for detecting movement (Abstract). Phillips further teaches a rotation sensor subsystem comprising a rotational sensor, the rotational sensor to be coupled to the at least one component of the downhole pumping system and to detect rotational movement of the at least one component of the downhole pumping system by sampling rotational velocity values with the rotational sensor generated by rotation of the at least one component of the downhole pumping system ([Claim 1 and 12; [00110]).

Additionally, Phillips discloses a processor configured to compare the determined rotational velocity of the at least one component of the downhole pumping system with an expected amount of rotational velocity to determine a failure in the rotation of the at least one component of the downhole pumping system [Claim 1; Claim 10].

Phillips fails to specifically mention a tubing rotator, he does mention tubing that surrounds the rod string (which is well known in the art as a tubular rotator (Hurst Col. 3, lines 42-49).

However, in a related field, Hurst teaches wherein monitoring is performed by a mechanism incorporated in at least one of a load cell, a rod rotator, or a tubing rotator (Claim 2).

Therefore, it would have been obvious to a person of ordinary skill in the art prior to the effective filing date of the claimed invention to have modified Phillips to incorporate the teachings of Hurst by including: a tubing rotator in order to distribute wear.

Regarding Claim 17, the combination further teaches the sensor system of claim 16, wherein the rotation sensor subsystem comprises at least one of a gyroscope or an accelerometer [Phillips: Claim 12].

Regarding Claim 18, the combination teaches all of the limitations of Claim 16. The combination further teaches wherein the rotation sensor subsystem is configured to monitor the rotation of the tubing rotator along a path that extends in a direction substantially perpendicular to a surface upon which the downhole pumping system is positioned [Hurst: Col. 13, lines 50-63].

Although Hurst doesn't specifically disclose "monitoring the rotation of the tubing rotator along a path that extends in a direction substantially perpendicular to a surface upon which the downhole pumping system is positioned," it is inherent that the path would be substantially perpendicular being that the monitoring system is surface level and the tubing rotator is subsurface and perpendicular to the surface.

Claim 12-15 are rejected under 35 U.S.C. 103 as being unpatentable over Phillips, in view of Puwanto et al. (US 20200362686A1) herein referred to as Puwanto.

Regarding Claim 12, Phillips teaches all of the limitations of Claim 1.

Phillips fails to teach a vibration sensor subsystem for monitoring vibration of the at least one component of the downhole pumping system in three axes over a vibrational baseline. However, in a related field,

Puwanto discloses a vibration measuring device included in the MWD tool that measures vibration detecting real time drilling parameters and can be used as a trigger (in an alarm system) for a system to hold on drilling parameter recommendation change [0032; 0129; 0149; 0161].

Therefore, it would have been obvious to a person of ordinary skill in the art prior to the effective filing date of the claimed invention to have modified Phillips to incorporate the teachings of Puwanto by including: a vibration measuring device in order to give early warning of component failure.

Regarding Claim 13, Phillips teaches a sensor system for a downhole pumping system [0019], comprising: a sensor subsystem for detecting movement of at least one component of the downhole pumping system [Claim 1], the sensor subsystem comprising:

an axial motion sensor subsystem comprising an axial motion sensor, the axial motion sensor to be coupled to the at least one component of the downhole pumping system and to measure axial movement of the at least one component of the downhole pumping system based on variations detected by the axial motion sensor generated by movement of the at least one component of the downhole pumping system [Col. 2, lines 33-48]; and

a rotation sensor subsystem comprising a rotational sensor, the rotational sensor to be coupled to the at least one component of the downhole pumping system and to detect rotational movement of the at least one component of the downhole pumping system by sampling rotational velocity values with the rotational sensor generated by rotation of the at least one component of the downhole pumping system ([Claim 1 and 12; [00110]); and

a processor subsystem to receive data from the axial motion sensor subsystem and the rotation sensor subsystem [Claim 1], the processor subsystem to:

verify the axial movement of the at least one component of the downhole pumping system with the axial motion sensor subsystem; and when the axial movement has been verified, determine rotational velocity of the at least one component of the downhole pumping system with the rotational velocity values detected by the rotation sensor subsystem [0021; Fig. 6; Claim 1].

Philips fails to teach a vibration sensor subsystem for monitoring vibration of the at least one component of the downhole pumping system in three axes; derive a vibrational baseline of the at least one component of the downhole pumping system from the vibration sensor subsystem in three axes during normal operation.

However, in a related field, Puwanto discloses a vibration measuring device included in the MWD tool that measures vibration detecting real time drilling parameters and can be used as a trigger (in an alarm system) for a system to hold on drilling parameter recommendation change [0032; 0129; 0149; 0161]. Although Puwanto doesn't specifically disclose vibrational baseline, one of ordinary skill in the art would determine that in order for a parameter to be used as a trigger, a baseline/threshold would have to be set.

Therefore, it would have been obvious to a person of ordinary skill in the art prior to the effective filing date of the claimed invention to have modified Phillips to incorporate the teachings of Puwanto by including: a vibration measuring device in order to give early warning of component failure.

Regarding Claim 14, Phillips further teaches the sensor system of claim 13, wherein the axial motion sensor subsystem comprises a magnetometer and the rotation sensor subsystem comprises a gyroscope [Claim 8; Claim 12].

Regarding Claim 15, Phillips further teaches the sensor system of claim 14, wherein the sensor subsystem is configured to detect movement of the at least one component of the downhole pumping system comprising at least one rod of the downhole pumping system extending from a surface location into a wellbore, and wherein the processor subsystem is configured to continue sampling the rotational velocity values of the at least one rod over a stroke of the at least one rod [0029; 0042; 00103; 00110].

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL J SINGLETARY whose telephone number is (571)272-4593. The examiner can normally be reached Monday-Friday 8:00am-5:00pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lisa Caputo can be reached on (571) 272-2388. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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