PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

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PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)* 25 FEB 2020

Applicant's or agent's file reference	FOR FURTHER ACTION
P-1611-PCT	See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 19/65070	06 December 2019 (06.12.2019)	07 December 2018 (07.12.2018)

International Patent Classification (IPC) or both national classification and IPC

IPC - F16K 37/00 (2020.01)

CPC - F16K 37/0008

Applicant
SMITH, KEVIN S.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	22 January 2020	Lee Young PCT Help Desk Telephone No. 571-272-4300

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 19/65070

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(b)).

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 19/65070

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	3-5, 7-9, 11-12, 14-16, 18	YES
	Claims	1-2, 6, 10, 13, 17	NO
Inventive step (IS)	Claims	none	YES
	Claims	1-18	NO
Industrial applicability (IA)	Claims	1-18	YES
	Claims	none	NO

2. Citations and explanations:
Claim 17 lacks novelty under PCT Article 33(2) as being anticipated by US 6,079,441 A to Miller et al. (hereinafter "Miller").

Regarding claim 17, Miller discloses an output device (87; Fig 2-3; col 2, ln 61-65) for use with a valve (10; Fig 1-3; col 2, ln 58-65), the output device (87) comprising:
(A) at least one sensor (25; Fig 3; col 3, ln 33-37) comprising a rotary sensor, two limit switches, a quarter tum indicator, position indicator sensor and any combination of two or more of the foregoing (rotary sensor 25 including a multi-turn potentiometer sensing a change in resistance and voltage across a rotating wiper 25a; Fig 3, 5, 8C; col 4, ln 8-33);
wherein the output device (87) is configured to receive a mechanical input (from gears 22, 61a, and spindle 32; Fig 3; col 3, ln 33-37, 65 to col 4, ln 4) as a hand wheel of the valve is operated (upon operation of hand wheel 12; Fig 1; col 2, ln 58-60; col 3, ln 65 to col 4, ln 4) and in response provide a signal (from 25 to at least electronic circuit board 88; Fig 3, 5, 8C; col 4, ln 8-28) that is indicative of the position of the valve (10; col 4, ln 28-33).

Claims 1-2, 6, 10, and 13 lack novelty under PCT Article 33(2) as being anticipated by GB 429,686 A to Jennings.

Regarding claim 1, Jennings discloses a device (device of Fig 1; pg 2, ln 21-22, 30-42) for indicating a position of a valve (pg 2, ln 30-42) comprising:
(A) a mechanical mechanism (B, B1, B2, B3, B4, B5 collectively; Fig 1; pg 2, ln 42-48) comprising:
(i) a first gear (B; Fig 1; pg 2, ln 42-48) configured to operatively connect to the valve (via spindle S; Fig 1; pg 2, ln 42-48);
(ii) a second gear (B1; Fig 1; pg 2, ln 42-48) coupled to a first end portion of a first support (a top end of spindle B2; Fig 1; pg 2, ln 42-48), wherein the second gear (B1) is sized and configured so as to mate with the first gear (B; Fig 1; pg 2, ln 42-48);
(iii) a third gear (B3; Fig 1; pg 2, ln 42-48) coupled to a second end portion of the first support (a lower end of a portion of spindle B2 between gear B1 and gear B3; Fig 1; pg 2, ln 42-48);
(iv) a fourth gear (B4; Fig 1; pg 2, ln 42-48) coupled to a first end portion of a second support (a first end of spindle B5; Fig 1; pg 2, ln 42-48), wherein the fourth gear (B4) mates with the third gear (B3; Fig 1; pg 2, ln 42-48); and
(v) a support member (F, G, G1 collectively; Fig 1; pg 2, ln 74-80) for supporting the first support (B2) and the second support (B5; Fig 1; pg 2, ln 42-48, 74-80), and adapted to affix the mechanical mechanism (B, B1, B2, B3, B4, B5 collectively) to the valve (to spindle S of the valve; Fig 1; pg 2, ln 42-48, 74-80); and
(B) an output device (P; Fig 1-2; pg 2, ln 48-58) operatively connected to the mechanical mechanism (coupled to second support spindle B5 of mechanical mechanism B, B1, B2, B3, B4, B5 collectively; Fig 1; pg 2, ln 42-58), wherein the output device (P) provides a signal (a visual signal to an observer of a position of P to indicate on scale A a position of the valve; Fig 2; pg 2, ln 30-42) that is indicative of the position of the valve (pg 2, ln 30-42, 102-105).

Regarding claim 2, Jennings discloses the device of claim 1 wherein the output device (P) is operatively connected to a second end portion of the second support (a second end portion of B5; Fig 1; pg 2, ln 42-48).

Regarding claim 6, Jennings discloses the device of claim 1 wherein the device for indicating the position of the valve (device of Fig 1, including mechanical mechanism B, B1, B2, B3, B4, B5 collectively and output device P) is operatively coupled to a hand wheel of the valve (H, via spindle S and gear B; Fig 1; pg 2, ln 30-48) so as to provide a signal (a visual signal to an observer of a position of P to indicate on scale A a position of the valve; Fig 2; pg 2, ln 30-42) that is indicative of the position of the valve when the valve is actuated (pg 2, ln 30-42, 102-105).

Regarding claim 10, Jennings discloses the device of claim 1 wherein the mechanical mechanism (B, B1, B2, B3, B4, B5 collectively) is positioned adjacent or below a hand wheel of the valve (H; Fig 1; pg 2, ln 30-48).

Regarding claim 13, Jennings discloses a method for indicating the position of a valve (a method of using the device of Fig 1 to indicate the position of a valve coupled to the valve spindle S; Fig 1; pg 1, ln 89 to pg 2, ln 8, 21-22, 30-42), the method comprising:
(A) operatively connecting the device of claim 1 (the device of Fig 1 of Jennings; pg 2, ln 21-22, 30-42) to a valve having a hand wheel (to a valve via spindle S having hand wheel H; Fig 1; pg 2, ln 30-48).

--- See Supplemental Box ---

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 19/65070

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Regarding claim 9, the recitation "the manual valve" lacks antecedent basis. Claim 1 previously recites a "valve". For the purposes of this opinion, this recitation in claim 9 is interpreted as "the valve".

Regarding claim 17, the recitation "the hand wheel" lacks antecedent basis. For the purposes of this opinion, this recitation is interpreted as "a hand wheel".

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 19/65070

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V.2. Citations and explanations

Claim 18 lacks an inventive step under PCT Article 33(3) as being obvious over Miller.

Regarding claim 18, Miller discloses the output device of claim 17 further comprising a position indicator sensor (88; Fig 3, 5, 8C; col 4, ln 8-28) that is operatively connected to the at least one sensor (25; Fig 3; col 4, ln 8-28), wherein the position indicator sensor (88) receives the signal that is indicative of a position of the valve (col 4, ln 28-33),
but Miller fails to disclose in the embodiment of Fig 1-5, 8C:
the position indicator sensor in response to the signal provides an indication of the position of the valve.
However, Miller discloses, in the embodiment of Fig 6A-6B and 8F, the position indicator sensor (alternate control circuit 88f on circuit board 88; Fig 6A-6B, 8F; col 4, ln 58-59) in response to a signal provides an indication of the position of a valve (via LEDs D1 and D2; Fig 6A-6B, 8F; col 4, ln 58-59; col 5, ln 3-9, 18-21, 27-29, 34-38).
It would have been obvious to one having ordinary skill in the art that the output device of Miller could have been modified as claimed in order to confirm to a user a status of the valve.

Claims 1-3, 11, and 15-16 lack an inventive step under PCT Article 33(3) as being obvious over Miller in view of Jennings.

Regarding claim 1, Miller discloses a device (22, 32, 34, 61a, 87 collectively; Fig 1, 3; col 2, ln 58-65; col 3, ln 3-5, 29-37, 65 to col 4, ln 4) for indicating a position of a valve (10; Fig 1-3; col 2, ln 58-65) comprising:
(A) a mechanical mechanism (gears 22, 61a collectively, the gears coupled to valve spindle 32; Fig 3; col 3, ln 33-37, 65 to col 4, ln 4) comprising:
(i) a first gear (61a; Fig 3; col 3, ln 33-37) configured to operatively connect to the valve (spindle 32 and bushing 34 of the valve; Fig 3; col 3, ln 3-5, 29-37, 65 to col 4, ln 4);
(ii) a second gear (22; Fig 3; col 3, ln 33-37) coupled to a first end portion of a first support (at a first end of 24a; Fig 3; col 3, ln 33-37), wherein the second gear (22) is sized and configured so as to mate with the first gear (61a; Fig 3; col 3, ln 33-37); and
(B) an output device (87; Fig 2-3; col 2, ln 61-65) operatively connected to the mechanical mechanism (gears 22, 61a collectively, via output 24a; Fig 3; col 3, ln 31-37), wherein the output device (87) provides a signal (from 25 to at least electronic circuit board 88; Fig 3, 5, 8C; col 4, ln 8-28) that is indicative of the position of the valve (10; col 4, ln 28-33), but Miller fails to disclose:
the mechanical mechanism comprising:
(iii) a third gear coupled to a second end portion of the first support;
(iv) a fourth gear coupled to a first end portion of a second support, wherein the fourth gear mates with the third gear; and
(v) a support member for supporting the first support and the second support, and adapted to affix the mechanical mechanism to the valve.
Jennings discloses a device (device of Fig 1; pg 2, ln 21-22, 30-42) for indicating a position of a valve (pg 2, ln 30-42) including:
(A) a mechanical mechanism (B, B1, B2, B3, B4, B5 collectively; Fig 1; pg 2, ln 42-48) including:
(i) a first gear (B; Fig 1; pg 2, ln 42-48) configured to operatively connect to the valve (via spindle S; Fig 1; pg 2, ln 42-48);
(ii) a second gear (B1; Fig 1; pg 2, ln 42-48) coupled to a first end portion of a first support (a top end of spindle B2; Fig 1; pg 2, ln 42-48), wherein the second gear (B1) is sized and configured so as to mate with the first gear (B; Fig 1; pg 2, ln 42-48);
(iii) a third gear (B3; Fig 1; pg 2, ln 42-48) coupled to a second end portion of the first support (a lower end of a portion of spindle B2 between gear B1 and gear B3; Fig 1; pg 2, ln 42-48);
(iv) a fourth gear (B4; Fig 1; pg 2, ln 42-48) coupled to a first end portion of a second support (a first end of spindle B5; Fig 1; pg 2, ln 42-48), wherein the fourth gear (B4) mates with the third gear (B3; Fig 1; pg 2, ln 42-48); and
(v) a support member (F, G, G1 collectively; Fig 1; pg 2, ln 74-80) for supporting the first support (B2) and the second support (B5; Fig 1; pg 2, ln 42-48, 74-80), and adapted to affix the mechanical mechanism (B, B1, B2, B3, B4, B5 collectively) to the valve (to spindle S of the valve; Fig 1; pg 2, ln 42-48, 74-80).
It would have been obvious to one having ordinary skill in the art that the device of Miller could have been modified as claimed in view of Jennings in order to permit the pinion coupled to the valve spindle to be readily dismounted to allow any repacking of a valve gland.

Regarding claim 2, the modified Miller discloses the device of claim 1 and the modified Miller discloses wherein the output device (Miller; 87) is operatively connected to a second end portion of the second support (Jennings; a second end portion of B5; Fig 1; pg 2, ln 42-48).

Regarding claim 3, the modified Miller discloses the device of claim 2, and Miller discloses wherein the output device (87) comprises one selected from the group consisting of a rotary sensor, two limit switches, a quarter turn indicator, and any combination of two or more of the foregoing (rotary sensor 25 including a multi-turn potentiometer sensing a change in resistance and voltage across a rotating wiper 25a; Fig 3, 5, 8C; col 4, ln 8-33).

Regarding claim 11, the modified Miller discloses the device of claim 1, and Miller discloses wherein a position indicator sensor (88; Fig 3, 5, 8C; col 4, ln 8-28) is operatively connected to the output device (portion 25 of output device 87; Fig 3; col 4, ln 8-28) and receives the signal that is indicative of a position of the valve (col 4, ln 28-33),
but Miller fails to disclose in the embodiment of Fig 1-5, 8C:
in response to the signal provides an indication of the position of the valve.
However, Miller discloses, in the embodiment of Fig 6A-6B and 8F, the position indicator sensor (alternate control circuit 88f on circuit board 88; Fig 6A-6B, 8F; col 4, ln 58-59) in response to a signal provides an indication of the position of a valve (via LEDs D1 and D2; Fig 6A-6B, 8F; col 4, ln 58-59; col 5, ln 3-9, 18-21, 27-29, 34-38).
It would have been obvious to one having ordinary skill in the art that the device of Miller could have been modified as claimed in order to confirm to a user a status of the valve.

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 19/65070

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V.2. Citations and explanations

Regarding claim 15, Miller discloses a device (22, 32, 34, 61a, 87 collectively; Fig 1, 3; col 2, ln 58-65; col 3, ln 3-5, 29-37, 65 to col 4, ln 4) for indicating a position of a valve (10; Fig 1-3; col 2, ln 58-65) comprising:
(A) a mechanical mechanism (gears 22, 61a collectively, the gears coupled to valve spindle 32; Fig 3; col 3, ln 33-37, 65 to col 4, ln 4) comprising:
(i) a first gear (61a; Fig 3; col 3, ln 33-37) configured to operatively connect to the valve (spindle 32 and bushing 34 of the valve; Fig 3; col 3, ln 3-5, 29-37, 65 to col 4, ln 4);
(ii) a second gear (22; Fig 3; col 3, ln 33-37) operatively connected to the first gear (61a; Fig 3; col 3, ln 33-37), wherein the second gear (22) is sized and configured so as to mate with the first gear (61a; Fig 3; col 3, ln 33-37);
(B) an output device (87; Fig 2-3; col 2, ln 61-65) operatively connected to the mechanical mechanism (gears 22, 61a collectively, via output 24a; Fig 3; col 3, ln 31-37), wherein the output device (87) provides a signal (from 25 to at least electronic circuit board 88; Fig 3, 5, 8C; col 4, ln 8-28) that is indicative of the position of the valve (10; col 4, ln 28-33),
but Miller fails to disclose:
(iii) a third gear operatively connected to the second gear;
(iv) a fourth gear operatively connected to the third gear; and
(v) a member for supporting the each of the gears, and adapted to affix the mechanical mechanism to the valve.
Jennings discloses a device (device of Fig 1; pg 2, ln 21-22, 30-42) for indicating a position of a valve (pg 2, ln 30-42) including:
(A) a mechanical mechanism (B, B1, B2, B3, B4, B5 collectively; Fig 1; pg 2, ln 42-48) including:
(i) a first gear (B; Fig 1; pg 2, ln 42-48) configured to operatively connect to the valve (via spindle S; Fig 1; pg 2, ln 42-48);
(ii) a second gear (B1; Fig 1; pg 2, ln 42-48) operatively connected to the first gear (B; Fig 1; pg 2, ln 42-48), wherein the second gear (B1) is sized and configured so as to mate with the first gear (B; Fig 1; pg 2, ln 42-48);
(iii) a third gear (B3; Fig 1; pg 2, ln 42-48) operatively connected to the second gear (B1, via spindle B2; Fig 1; pg 2, ln 42-48);
(iv) a fourth gear (B4; Fig 1; pg 2, ln 42-48) operatively connected to the third gear (B3; Fig 1; pg 2, ln 42-48); and
(v) a member (F, G, G1 collectively; Fig 1; pg 2, ln 74-80) for supporting the each of the gears (B, B1, B3, B4; Fig 1; pg 2, ln 42-48, 74-80), and adapted to affix the mechanical mechanism (B, B1, B2, B3, B4, B5 collectively) to the valve (to spindle S of the valve; Fig 1; pg 2, ln 42-48, 74-80).
It would have been obvious to one having ordinary skill in the art that the device of Miller could have been modified as claimed in view of Jennings in order to permit the pinion coupled to the valve spindle to be readily dismounted to allow any repacking of a valve gland.

Regarding claim 16, Miller discloses a mechanical mechanism (gears 22, 61a collectively, the gears coupled to valve spindle 32; Fig 3; col 3, ln 33-37, 65 to col 4, ln 4) for use with a valve (10; Fig 1-3; col 2, ln 58-65), the mechanical mechanism comprising:
(A) a first gear (61a; Fig 3; col 3, ln 33-37) configured to operatively connect to the valve (spindle 32 and bushing 34 of the valve; Fig 3; col 3, ln 3-5, 29-37, 65 to col 4, ln 4);
(B) a second gear (22; Fig 3; col 3, ln 33-37) coupled to a first end portion of a first support (at a first end of 24a; Fig 3; col 3, ln 33-37), wherein the second gear (22) is sized and configured so as to mate with the first gear (61a; Fig 3; col 3, ln 33-37);
wherein the mechanical mechanism (gears 22, 61a collectively) is configured to be operatively connected to an output device (87; Fig 2-3; col 2, ln 61-65; col 3, ln 31-37) capable of producing a signal (from 25 to at least electronic circuit board 88; Fig 3, 5, 8C; col 4, ln 8-28) that is indicative of the position of the valve (10; col 4, ln 28-33),
but Miller fails to disclose:
(C) a third gear coupled to a second end portion of the first support;
(D) a fourth gear coupled to a first end portion of a second support, wherein the fourth gear mates with the third gear; and
(E) a support member for supporting the first support and the second support, and adapted to affix the mechanical mechanism to the valve.
Jennings discloses a mechanical mechanism (B, B1, B2, B3, B4, B5 collectively; Fig 1; pg 2, ln 42-48) for use with a valve (pg 2, ln 30-48), the mechanical mechanism including:
(A) a first gear (B; Fig 1; pg 2, ln 42-48) configured to operatively connect to the valve (via spindle S; Fig 1; pg 2, ln 42-48);
(B) a second gear (B1; Fig 1; pg 2, ln 42-48) coupled to a first end portion of a first support (a top end of spindle B2; Fig 1; pg 2, ln 42-48), wherein the second gear (B1) is sized and configured so as to mate with the first gear (B; Fig 1; pg 2, ln 42-48);
(C) a third gear (B3; Fig 1; pg 2, ln 42-48) coupled to a second end portion of the first support (a lower end of a portion of spindle B2 between gear B1 and gear B3; Fig 1; pg 2, ln 42-48);
(D) a fourth gear (B4; Fig 1; pg 2, ln 42-48) coupled to a first end portion of a second support (a first end of spindle B5; Fig 1; pg 2, ln 42-48), wherein the fourth gear (B4) mates with the third gear (B3; Fig 1; pg 2, ln 42-48); and
(E) a support member (F, G, G1 collectively; Fig 1; pg 2, ln 74-80) for supporting the first support (B2) and the second support (B5; Fig 1; pg 2, ln 42-48, 74-80), and adapted to affix the mechanical mechanism (B, B1, B2, B3, B4, B5 collectively) to the valve (to spindle S of the valve; Fig 1; pg 2, ln 42-48, 74-80).
It would have been obvious to one having ordinary skill in the art that the device of Miller could have been modified as claimed in view of Jennings in order to permit the pinion coupled to the valve spindle to be readily dismounted to allow any repacking of a valve gland.

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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 19/65070

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V.2. Citations and explanations

Claims 1-2 and 4-5 lack an inventive step under PCT Article 33(3) as being obvious over Miller in view of GB 172,084 A to The Newman Clock Company (hereinafter "Newman").

Regarding claim 1, Miller discloses a device (22, 32, 34, 61a, 87 collectively; Fig 1, 3; col 2, ln 58-65; col 3, ln 3-5, 29-37, 65 to col 4, ln 4) for indicating a position of a valve (10; Fig 1-3; col 2, ln 58-65) comprising:
(A) a mechanical mechanism (gears 22, 61a collectively, the gears coupled to valve spindle 32; Fig 3; col 3, ln 33-37, 65 to col 4, ln 4) comprising:
(i) a first gear (61a; Fig 3; col 3, ln 33-37) configured to operatively connect to the valve (spindle 32 and bushing 34 of the valve; Fig 3; col 3, ln 3-5, 29-37, 65 to col 4, ln 4);
(ii) a second gear (22; Fig 3; col 3, ln 33-37) coupled to a first end portion of a first support (at a first end of 24a; Fig 3; col 3, ln 33-37), wherein the second gear (22) is sized and configured so as to mate with the first gear (61a; Fig 3; col 3, ln 33-37); and
(B) an output device (87; Fig 2-3; col 2, ln 61-65) operatively connected to the mechanical mechanism (gears 22, 61a collectively, via output 24a; Fig 3; col 3, ln 31-37), wherein the output device (87) provides a signal (from 25 to at least electronic circuit board 88; Fig 3, 5, 8C; col 4, ln 8-28) that is indicative of the position of the valve (10; col 4, ln 28-33), but Miller fails to disclose:
the mechanical mechanism comprising:
(iii) a third gear coupled to a second end portion of the first support;
(iv) a fourth gear coupled to a first end portion of a second support, wherein the fourth gear mates with the third gear; and
(v) a support member for supporting the first support and the second support, and adapted to affix the mechanical mechanism to the valve.
Newman discloses a device (device attached to valve 11 of Fig 1; pg 2, ln 29-78) for indicating a position of a valve (11; Fig 1; pg 2, ln 29-41; pg 3, ln 49-64) comprising:
(A) a mechanical mechanism (16, 17, 18, 20, 26, 27, 28, 32, 33, 34 collectively; Fig 1, 4-5; pg 2, ln 42-77) comprising:
(i) a first gear (16; Fig 1; pg 2, ln 42-45) configured to operatively connect to the valve (11; Fig 1; pg 2, ln 32-45);
(ii) a second gear (27; Fig 4-5; pg 2, ln 54-58) coupled to a first end portion of a first support (a first end of shaft 26; Fig 4-5; pg 2, ln 54-58), wherein the second gear (27) is sized and configured so as to mate with the first gear (16, via gears 17, 18, 20, 28; Fig 1, 4-5; pg 2, ln 42-71);
(iii) a third gear (32; Fig 1; pg 2, ln 72-77) coupled to a second end portion of the first support (a second end of shaft 26; Fig 1, 4; pg 2, ln 53-58, 72-77);
(iv) a fourth gear (33; Fig 1; pg 2, ln 72-77) coupled to a first end portion of a second support (a first end of bearing 34; Fig 1; pg 2, ln 72-77), wherein the fourth gear (33) mates with the third gear (32; Fig 1; pg 2, ln 72-77); and
(v) a support member (23, 24, 25 collectively; pg 2, ln 47-58, 72-77) for supporting the first support (26) and the second support (34; Fig 1; pg 2, ln 47-58, 72-77), and adapted to affix the mechanical mechanism (16, 17, 18, 20, 26, 27, 28, 32, 33, 34 collectively) to the valve (11, via 24; Fig 1; pg 2, ln 32-41, 47-58).
It would have been obvious to one having ordinary skill in the art that the device of Miller could have been modified as claimed in view of Newman in order to selectively render a record producing device inoperable on movement of the valve toward an abnormal position to prevent a user from inadvertently recording that the valve is in a normal position.

Regarding claim 2, the modified Miller discloses the device of claim 1 and the modified Miller discloses wherein the output device (Miller; 87) is operatively connected to a second end portion of the second support (Newman; a second, bottom end of bearing 34; Fig 1; pg 2, ln 72-77).

Regarding claim 4, the modified Miller discloses the device of claim 2, but Miller fails to disclose wherein the output device is operatively connected to the second end portion of the second support with a coupling and a flexible shaft.
Newman further discloses the device (device attached to valve 11 of Fig 1; pg 2, ln 29-78) including an output device (components internal to 42; Fig 2) operatively connected to the second end portion of the second support (a second, bottom end of bearing 34; Fig 1) with a coupling (nut shown at the exterior of 42 connected to 47; Fig 2) and a flexible shaft (47; Fig 1-2; pg 2, ln 72-78, 85-92).
It would have been obvious to one having ordinary skill in the art that the device of Miller could have been further modified as claimed in view of Newman in order to enable a user to view a status of the valve remotely from the valve.

Regarding claim 5, the modified Miller discloses the device of claim 4, but Newman fails to expressly disclose wherein the flexible shaft has a length in the range of from about 1 to about 20 feet.
However, it would have been obvious to one having ordinary skill in the art, practicing routine experimentation and design techniques, that the device of Miller could have been modified as claimed in order to enable a user to view the status of the valve as remotely from the valve as desired.

--- See Supplemental Box ---

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 19/65070

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V.2. Citations and explanations

Claims 7-8 lack an inventive step under PCT Article 33(3) as being obvious over Miller and Jennings in view of US 2,028,696 A to Beckwith.

Regarding claim 7, the modified Miller discloses the device of claim 1, but Miller fails to disclose wherein a longitudinal axis of the second gear is substantially orthogonal relative to a longitudinal axis of the first gear.
Beckwith discloses a device (internal components of housing 9; Fig 1, 5; pg 2, col 1, ln 26-29) coupled to a valve (1, via shaft 10, gears 11 and 12, and valve stem 3; Fig 1; pg 2, col 1, ln 9-29), the device including a first gear (20; Fig 5; pg 2, col 2, ln 26-29), a second gear (21; Fig 5; pg 2, col 2, ln 26-29), a third gear (unmarked gear coupled at the right end of shaft 22; Fig 5; col 2, ln 26-29), and a fourth gear (unmarked bevel gear coupled to the third gear; Fig 5), wherein the longitudinal axis of the second gear (a generally horizontal axis along shaft 22 and gear 21; Fig 5) is substantially orthogonal relative to a longitudinal axis of the first gear (a generally vertical axis extending along shaft 10 and first gear 20).
It would have been obvious to one having ordinary skill in the art that the device of Miller could have been further modified as claimed in view of Beckwith such that components connected to the gear train are in a desired orientation relative to the valve stem.

Regarding claim 8, the modified Miller discloses the device of claim 7, but Miller fails to disclose wherein a longitudinal axis of the third gear is substantially orthogonal relative to a longitudinal axis of the fourth gear.
Beckwith discloses a device (internal components of housing 9; Fig 1, 5; pg 2, col 1, ln 26-29) coupled to a valve (1, via shaft 10, gears 11 and 12, and valve stem 3; Fig 1; pg 2, col 1, ln 9-29), the device including a first gear (20; Fig 5; pg 2, col 2, ln 26-29), a second gear (21; Fig 5; pg 2, col 2, ln 26-29), a third gear (unmarked gear coupled at the right end of shaft 22; Fig 5; col 2, ln 26-29), and a fourth gear (unmarked bevel gear coupled to the third gear; Fig 5), wherein the longitudinal axis of the third gear (a generally horizontal axis along the shaft 22 and the third gear; Fig 5) is substantially orthogonal relative to a longitudinal axis of the fourth gear (a generally vertical axis along the shaft connected to the fourth gear; Fig 5).
It would have been obvious to one having ordinary skill in the art that the device of Miller could have been further modified as claimed in view of Beckwith such that components connected to the gear train are in a desired orientation relative to the valve stem.

Claim 9 lacks an inventive step under PCT Article 33(3) as being obvious over Miller and Jennings in view of WO 01/20263 A1 to Huntleigh Technology PLC (hereinafter "Huntleigh").

Regarding claim 9, the modified Miller discloses the device of claim 1, and the modified Miller discloses wherein the output device (Miller; 87) comprises a rotary sensor (Miller; rotary sensor 25 including a multi-turn potentiometer sensing a change in resistance and voltage across a rotating wiper 25a; Fig 3, 5, 8C; col 4, ln 8-33) coupled to the second end portion of the second support (Jennings; a second end portion of B5; Fig 1; pg 2, ln 42-48), wherein the rotary sensor (Miller; 25) transmits a signal indication of a position of the valve (Miller; to at least electronic circuit board 88; Fig 3, 5, 8C; col 4, ln 8-33).
but the modified Miller fails to disclose:
wherein the rotary sensor has a number of turns in the range of from about 50 to about 100 turns.
Huntleigh discloses a rotary sensor (1; Fig 1; pg 3, ln 26-27) including fifty turns (pg 3, ln 27-31).
It would have been obvious to one having ordinary skill in the art that the device of Miller could have been further modified as claimed in view of Huntleigh in order to provide absolute and relative position sensing.

Claims 12 and 14 lack an inventive step under PCT Article 33(3) as being obvious over Miller and Jennings in view of US 2017/0097106 A1 to Mueller International, LLC (hereinafter "Mueller").

Regarding claim 12, the modified Miller discloses the device of claim 1, and Miller discloses wherein a position indicator sensor (88; Fig 3, 5, 8C; col 4, ln 8-28) is operatively connected to the output device (portion 25 of the output device 87; Fig 3; col 4, ln 8-28) and receives the signal that is indicative of a position of the valve (col 4, ln 28-33),
but Miller fails to disclose in the embodiment of Fig 1-5, 8C:
the position indicator sensor as a wireless position indicator sensor; and
the position indicator sensor in response to the signal provides an indication of the position of the valve.
However, Miller discloses, in the embodiment of Fig 6A-6B and 8F, the position indicator sensor (alternate control circuit 88f on circuit board 88; Fig 6A-6B, 8F; col 4, ln 58-59) in response to a signal provides an indication of the position of a valve (via LEDs D1 and D2; Fig 6A-6B, 8F; col 4, ln 58-59; col 5, ln 3-9, 18-21, 27-29, 34-38), but Miller fails to disclose the position indicator sensor as a wireless position indicator sensor.
Mueller discloses a position indicator (100; of Fig 3; para [0033]) wirelessly connected to a position indicator sensor (1210; Fig 12; para [0059]).
It would have been obvious to one having ordinary skill in the art that the device of Miller could have been modified as claimed in order to confirm to a user a status of the valve; and it would have been obvious to one having ordinary skill in the art that the device of Miller could have been modified as claimed in view of Mueller in order to provide a visual readout of the status of the valve to the user remotely from the valve.

Regarding claim 14, the modified Miller discloses the method of claim 12, and Miller discloses wherein the device (22, 32, 34, 61a, 87 collectively) is operatively coupled to the hand wheel of the valve (operatively connected to hand wheel 12 via spindle 32 and bushing 34; Fig 1, 3; col 2, ln 58-65; col 3, ln 3-5, 29-37) and positioned adjacent to or below the hand wheel of the valve (positioned within housing 22 below the hand wheel 12; Fig 1, 3; col 2, ln 58-65; col 3, ln 3-5, 29-37).

Claims 1-18 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.