

(51) International Patent Classification:

F04B 53/20 (2006.01)

(21) International Application Number:

PCT/US20 14/024624

(22) International Filing Date:

12 March 2014 (12.03.2014)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/852,260 15 March 2013 (15.03.2013) US

(71) Applicant: RPM INDUSTRIES, LLC [US/US]; 1660 Jefferson Avenue, Washington, PA 15301 (US).

(72) Inventor: APOSTOLIDES, John, K.; 1026 Progress Street, Apartment B 304, Pittsburgh, PA 15212 (US).

(74) Agents: LAZZARA, Michael, D. et al; K&L Gates LLP, K&L Gates Center, 210 Sixth Avenue, Pittsburgh, PA 15222-2613 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,

OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.1 7(H))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.1 7(in))

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:

13 November 2014

(54) Title: CONTROLLING FLUID OPERATIONS FOR MACHINE SYSTEMS

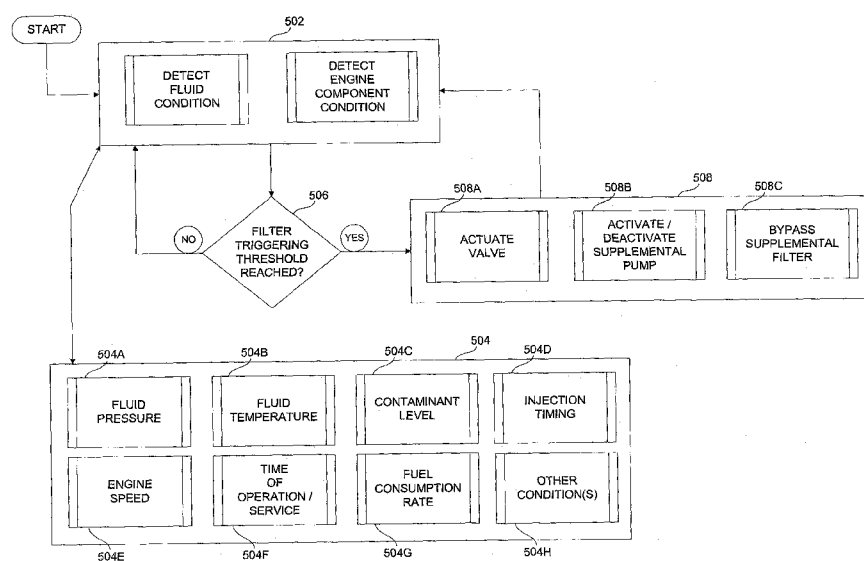


FIG. 5

(57) **Abstract:** Enhanced tools and techniques are disclosed for performing post-lubrication fluid operations and other fluid maintenance operations on the fluid system of a machine. A control module may be provided for initiating post-lubrication fluid operations for regulating temperature of engine components, for example, such as when a machine has been powered down after use.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/24624

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - F04B 53/20 (2014.01)

USPC - 417/212

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) Classification(s): F04B 49/00, 49/04, 53/18, 53/20; F16D 33/00 (2014.01)

CPC Classification(s): F04B 49/10, 49/20, 49/103; F16D 33/02; USPC Classification(s): 60/329; 123/196; 417/12, 13, 14, 32, 212

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

MicroPatent (US Granted, US Applications, EP-A, EP-B, WO, JP, DE-G, DE-A, DE-T, DE-U, GB-A, FR-A); Google; Google Scholar; ProQuest; IP.com; keywords: fluid, oil, lubricant, maintenance, service, processor, circuit, electronic, temperature, engine, idling, pressure, pump, filter

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	US 2012/0063927 A1 (MURRAY L O et al.) Mar. 15, 2012; paragraphs [0017], [0024], [0025], [0031], [0039], [0041], [0043], [0052]-[0054], [0125]	1-4, 6-14 --- 5, 15-17
Y	US 4,570,069 A (GAGER D J) Feb. 11, 1986; column 2, lines 55-65; column 4, lines 5-20	5
Y	US 5,918,573 A (KILLION D L) Jul. 6, 1999; column 2, lines 5-10; column 4, lines 55-68	15
Y	US 4,628,877 A (SUNDLES T B et al.) Dec. 16, 1986; column 2, lines 5-15; column 3, lines 40-60; column 4, lines 1-15	16
Y	US 4,491,103 A (DEADMAN R) Jan. 1, 1985; column 2, lines 30-40; column 3, lines 30-50; column 4, lines 20-40, 45-60	17
P, X	US 2013/0330205 A1 (APOSTOLIDES J K et al.) Dec. 12, 2013; entire document	1-17

I Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

28 August 2014 (28.08.2014)

Date of mailing of the international search report

12 SEP 2014

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/24624

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

---Please See Supplemental Page---

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
- 3-**D** ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-17

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/24624

-" *-Continued from Box No. III: Observations where unity of invention is lacking-" *-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-17 are directed toward a triggering condition.

Group II: Claims 18-43 are directed toward accessing machine data.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons.

The special technical features of Group I include at least one processor, wherein the control module is programmed to receive at least one signal indicative of at least one of a triggering condition or a machine condition; and, at least one fluid control circuit configured for receiving at least one signal from the control module, wherein the signal includes at least one command instruction for causing a fluid system of the machine to initiate a post-lubrication fluid operation (which are not present in Group II).

The special technical features of Group II include a control circuit configured for activating or deactivating at least one pump of a machine; a fluid maintenance system operatively associated with the control module, wherein the fluid maintenance system comprises a processor configured for: accessing machine data associated with the machine, and accessing a fluid service operation schedule including at least one fluid maintenance operation associated with the machine data; and, wherein the control module is programmed for communicating with the fluid maintenance system and operating the pump of the machine through the control circuit to perform a fluid maintenance operation in accordance with the fluid service operation schedule (which are not present in Group I).

The common technical features of Groups I-II include a control module.

These common technical features are disclosed by US 2012/0063927 A1 (MURRAY): a control module (engine control module 104 (control module) has a processor; paragraphs [0017], [0025]).

Because the common technical features are disclosed by Murray, the inventions are not so linked as to form a single general inventive concept. Therefore, Groups I and II lack unity.