



(51) International Patent Classification:

G01F 1/72 (2006.01) G01F 1/86 (2006.01)
G01F 1/34 (2006.01) G01F 1/88 (2006.01)
G01F 1/76 (2006.01) G01F 25/00 (2006.01)
G01F 1/78 (2006.01)

(21) International Application Number:

PCT/SE2019/050631

(22) International Filing Date:

27 June 2019 (27.06.2019)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

1850818-4 29 June 2018 (29.06.2018) SE

(71) Applicant: **PROVTAGAREN AB** [SE/SE]; Box 29, 245
21 STAFFANSTORP (SE).

(72) Inventors: **OTTOSEN, Daniel**; Förbindelsegången 4, 226
51 LUND (SE). **DALENE, Marianne**; Överlärarevägen
11, 224 67 LUND (SE). **SKARPING, Gunnar**; Över-
lärarevägen 11, 224 67 LUND (SE).

(74) Agent: **AWA SWEDEN AB**; Petter Lindgren, Box 5117,
200 71 MALMÖ (SE).

(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, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, 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, ST, 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).

(54) Title: METHOD FOR DIGITAL FLOW MEASUREMENT IN PULSATING FLOWS

(57) Abstract: The invention relates to a method for flow measurement in pulsating flows, wherein said method comprises the steps of: a) providing a flow meter (1) comprising an inlet (2) and an outlet (3), a flow channel (4) extending between said inlet (2) and outlet (3), a first mass flow sensor (6) located inside said flow channel (4), a control unit in communication with the first flow channel, b) repeatedly b1) acquiring a signal sample of the output signal from the mass flow sensor (6), b2) translating the signal sample to a mass flow value using a previously made calibration, and c) providing an output signal comprising the last mass flow value.

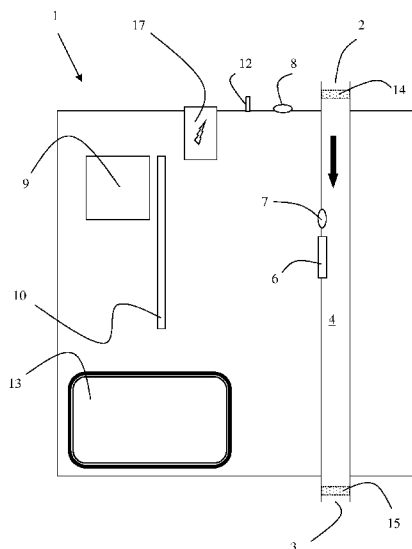


Fig. 1



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 February 2020 (13.02.2020)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2019/050631

A. CLASSIFICATION OF SUBJECT MATTER		
IPC: see extra sheet		
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: G01F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE, DK, FI, NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
EPO-Internal, PAJ, WPI data, COMPENDEX, EMBASE, INSPEC, IBM-TDB		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CA 2916094 A1 (PROVTAGAREN AB), 31 December 2014 (2014-12-31); figure 1; claims 1,4,8,9,12,13,15,17 --	1-15
Y	US 20030234048 A1 (SHAJII ALI ET AL), 25 December 2003 (2003-12-25); paragraphs [0081]-[0082] --	1-15
A	WO 2011108981 A1 (PROVTAGAREN AB ET AL), 9 September 2011 (2011-09-09); whole document --	1-15
A	US 20030236592 A1 (SHAJII ALI ET AL), 25 December 2003 (2003-12-25); paragraph [0009] --	5
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents:		
“A” document defining the general state of the art which is not considered to be of particular relevance	“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	
“D” document cited by the applicant in the international application	“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	
“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)	“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	
“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	“&” document member of the same patent family	
Date of the actual completion of the international search 10-01-2020	Date of mailing of the international search report 10-01-2020	
Name and mailing address of the ISA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Authorized officer Kristin Wiklund Telephone No. + 46 8 782 28 00	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2019/050631

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20130092258 A1 (YASUDA TADAIHIRO ET AL), 18 April 2013 (2013-04-18); whole document --	7
A	US 20150276449 A1 (ITO HIROYUKI), 1 October 2015 (2015-10-01); whole document --	1-15
A	US 20180173249 A1 (HAYASHI SHIGEYUKI ET AL), 21 June 2018 (2018-06-21); whole document --	1-15
A	US 6119710 A (BROWN TIMOTHY R), 19 September 2000 (2000-09-19); whole document -- -----	1-15

Continuation of: second sheet

International Patent Classification (IPC)

G01F 1/72 (2006.01)
G01F 1/34 (2006.01)
G01F 1/76 (2006.01)
G01F 1/78 (2006.01)
G01F 1/86 (2006.01)
G01F 1/88 (2006.01)
G01F 25/00 (2006.01)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2019/050631

CA	2916094 A1	31/12/2014	AU	2014299356 A1	21/01/2016
			BR	112015031778 A2	25/07/2017
			CN	105378451 A	02/03/2016
			EP	3014242 A1	04/05/2016
			JP	2016525681 A	25/08/2016
			JP	6556709 B2	07/08/2019
			KR	20160024953 A	07/03/2016
			US	20160139097 A1	19/05/2016
			US	10222359 B2	05/03/2019
			WO	2014209219 A1	31/12/2014
US	20030234048 A1	25/12/2003	US	7004191 B2	28/02/2006
WO	2011108981 A1	09/09/2011	AU	2011221617 A1	13/09/2012
			CA	2791462 A1	09/09/2011
			CN	102870059 B	12/08/2015
			EP	2542947 A4	03/01/2018
			JP	5748231 B2	15/07/2015
			JP	2013521495 A	10/06/2013
			KR	20120135909 A	17/12/2012
			KR	101874651 B1	04/07/2018
			US	9329066 B2	03/05/2016
			US	20120329166 A1	27/12/2012
US	20030236592 A1	25/12/2003	US	6810308 B2	26/10/2004
US	20130092258 A1	18/04/2013	JP	5873681 B2	01/03/2016
			JP	2013088946 A	13/05/2013
			KR	20130040741 A	24/04/2013
US	20150276449 A1	01/10/2015	JP	6264152 B2	24/01/2018
			JP	2015194421 A	05/11/2015
			KR	20150113871 A	08/10/2015
			US	9417108 B2	16/08/2016
US	20180173249 A1	21/06/2018	CN	108227763 A	29/06/2018
			JP	2018097759 A	21/06/2018
			KR	20180069708 A	25/06/2018
			TW	201823901 A	01/07/2018
			US	10503179 B2	10/12/2019