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(54) Title: FLUID CIRCULATION

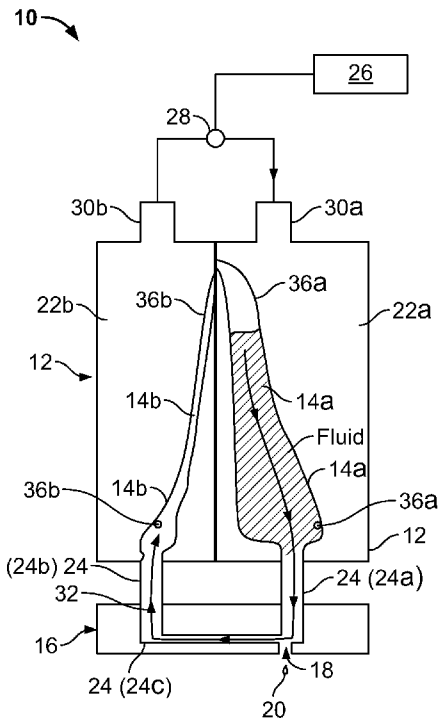

FIG. 1

(57) Abstract: Among other things, an apparatus for use in fluid jetting is described. The apparatus comprises a printhead including a flow path and a nozzle in communication with the flow path that has a first end and a second end. The apparatus also includes a first container fluidically coupled to the first end of the flow path, a second container fluidically coupled to the second end of the flow path, and a controller. The first container has a first controllable internal pressure and the second container has a second controllable internal pressure. The controller controls the first internal pressure and the second internal pressure to have a fluid flow between the first container and the second container through the flow path in the printhead according to a first mode and a second mode. In either mode, at least a portion of the fluid flowing along the flow path is delivered to the nozzle when the nozzle is jetting. The first mode has the first internal pressure higher than the second internal pressure and the second mode has the second internal pressure higher than the first internal pressure. The fluid flows from the first container to the second container according to the first mode and flows from the second container to the first container according to the second mode.

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A. CLASSIFICATION OF SUBJECT MATTER

B41J 2/175(2006.01)i, B41J 2/14(2006.01)i, B41J 2/045(2006.01)i

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B41J 2/175; B41J 29/38

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

Korean utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: inkjet printer, printhead, circulation, recirculation, pressure difference, vacuum, clogging, drying, air bubble, coagulation, flow path, nozzle, container, controller, sensor, delivering.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009-0051722 A1 (KAIHO SATOSHI) 26 February 2009 See abstract, paragraphs [0024], [0047], [0048], [0051]-[0056] and figures 2,	21
A	5	1-20,22-26
X	JP 2010-228350 A (DAINIPPON SCREEN MFG CO LTD) 14 October 2010	21
A	See abstract, paragraphs [0028]-[0032], [0034], [0036] and figures 2, 3	1-20,22-26
A	JP 2009-101516 A (FUJIFILM CORP et al.) 14 May 2009 See abstract, paragraphs [0085], [0098]-[0101], [0106] and figures 6, 7	1-26
A	JP 10-114081 A (SEIKO EPSON CORP) 06 May 1998 See abstract, paragraphs [0022]-[0024] and figure 4	1-26

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

☒ See patent family annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009-0051722 A1	26.02.2009	JP 04-964823 B2	06.04.2012
		JP 2009-045919 A	05.03.2009
		US 8186819 B2	29.05.2012
JP 2010-228350 A	14.10.2010	None	
JP 2009-101516 A	14.05.2009	CN 101412322 A	22.04.2009
		DE 602008001294 D1	01.07.2010
		EP 2050572 A2	22.04.2009
		EP 2050572 A3	13.05.2009
		EP 2050572 B1	19.05.2010
		JP 04-971942 B2	13.04.2012
		US 2009-0102879 A1	23.04.2009
		US 8128212 B2	06.03.2012
JP 10-114081 A	06.05.1998	JP 3419220 B2	23.06.2003