Title: PIEZOELECTRIC FOAMING PUMP

Abstract: A piezoelectric foaming pump is provided herein. The piezoelectric foaming pump includes a housing having a first opening for receiving a liquid from a liquid container and a piezoelectric element secured to the housing. The piezoelectric element includes a plurality of holes there through. In addition, the housing includes an air inlet. Although the piezoelectric element has holes there through, prior to activating the piezoelectric element, liquid does not pass through the plurality of holes. When the piezoelectric element is energized, liquid passes through the plurality of holes due to the rapid vibration of the piezoelectric element and is dispensed as a foam. Additionally, a piezoelectric foaming pump having a fluid pump chamber; an air pump chamber; a mixing chamber; a piezoelectric element; and an outlet nozzle is disclosed herein. During operation, fluid pumped from the fluid chamber mixes with air pumped from an air chamber in the mixing chamber and the resulting mixture is passed through the piezoelectric element and dispensed out of a nozzle.
Date of publication of the international search report:

8 March 2012
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. F04B13/02 F04B17/00 A47K5/14 A61K8/04 B05B7/00

ADD.

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

B. DOCUMENTS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B05B B01F F04B A47K A61K

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.


Y page 12, line 15 - page 21, line 20; claims 1,5,6,8, 12,14,15; figures 4b-8 1-6

Y us 2006/273474 AI (WITTE ULRICH [DE]) 7 December 2006 (2006-12-07) paragraphs [0001] - [0034]; claims 1,3,5; figures 1-4 1,4-6

Y us 2010/102083 AI (QUINLAN ROBERT L [US]) 29 April 2010 (2010-04-29) paragraphs [0002] - [0028]; figure 1 2,3,6

* 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 document but published on or after the international filing date

“L” later 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.

“Z” document member of the same patent family

Date of the actual completion of the international search 12 September 2011

Date of mailing of the international search report 29/12/2011

Name and mailing address of the ISA/Authorized officer

European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk
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Jurado Orenes, A
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).

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

see additional sheet

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 an additional fee, this Authority did not invite payment of additional fees.

3. [ ] 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.:

"see additional sheet(s)"

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.
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6

A piezoelectric foaming pump comprising:
- a housing having a first opening for receiving a liquid from a liquid container;
- a piezoelectric element secured to the housing and having a plurality of holes there through;
- an air inlet into the housing;
wherein prior to activating the piezoelectric element, liquid does not pass through the plurality of holes, and wherein activating the piezoelectric element causes liquid to pass through the plurality of holes and be dispensed as a foam.

2. claims: 7-14

A piezoelectric foaming pump comprising:
- a fluid pump chamber;
- an air pump chamber;
- a mixing chamber;
- a piezoelectric element; and
- an outlet nozzle;
wherein during operation, fluid is pumped from the fluid chamber and mixes with air that is pumped from an air chamber in the mixing chamber and wherein the mixture is passed through the piezoelectric element and dispensed out of a nozzle.

3. claims: 15-20

A piezoelectric foaming pump comprising:
- a housing having a plurality of chambers,
- a first piezoelectric element located between a first and second chamber;
- a second piezoelectric element located downstream of the second chamber;
wherein fluid enters the housing and passes through the first piezoelectric element wherein the fluid is atomized; and
wherein the atomized fluid passes through the second piezoelectric element and is output as a foam.
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