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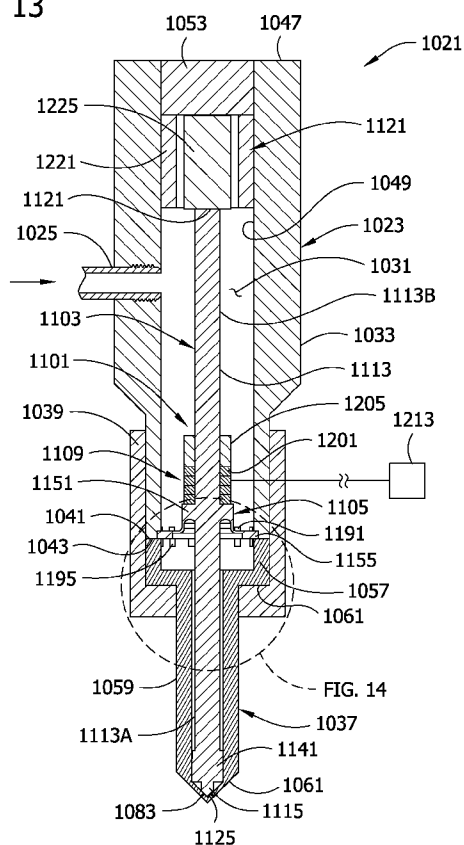
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[Continued on next page]

(54) Title: ULTRASONIC LIQUID DELIVERY DEVICE

FIG. 13



(57) Abstract: An ultrasonic liquid delivery device including a housing having an internal chamber and at least one exhaust port communicating with the internal chamber. An ultrasonic waveguide in the internal chamber ultrasonically energizes liquid within the chamber prior to the liquid being exhausted through the exhaust port. The waveguide includes a valve member movable relative to the housing between a closed position closing the exhaust port, and an open position. An excitation device is operable in the open position of the valve member to ultrasonically excite the ultrasonic waveguide to atomize liquid exiting the exhaust port.



NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG,  
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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: G05D

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 since 1975

Japanese Utility Models and applications for Utility Models since 1975

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

eKIPASS (KIPO internal) &amp; keywords: ultrasonic, valve, injector

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                               | Relevant to claim No. |
|-----------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A         | US 4,974,780 A (HIROMI NAKAMURA et al.) 4 December 1990<br>See Column 1, Line 5 - Column 11, Line 30; Abstract and Figures 1-6.  | 1-35                  |
| A         | US 4,978,067 A (HARVEY L. BERGER et al.) 18 December 1990<br>See Column 1, Line 5 - Column 3, Line 54; Abstract and Figures 1-2. | 1-35                  |
| A         | US 5,169,067 A (MASANOBU MATSUSAKA et al.) 8 December 1992<br>See Column 1, Line 5 - Column 3, Line 16; Abstract and Figure 1.   | 1-35                  |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

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| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                                                                                   | Publication<br>date                                                                                     |
|-------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| US 4974780 A                              | 04. 12. 1990        | CA 1333866 C<br>DE 68924202 D1<br>DE 68924202 T2<br>EP 0347891 A1<br>EP 0347891 B1<br>JP 02-004104 A<br>KR 10-1991-0001239 A | 10.01. 1995<br>19. 10. 1995<br>15.02. 1996<br>27. 12. 1989<br>13.09. 1995<br>09.01. 1990<br>30.01. 1991 |
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| US 5169067 A                              | 08. 12. 1992        | JP 04-086367                                                                                                                 | 18.03. 1992                                                                                             |