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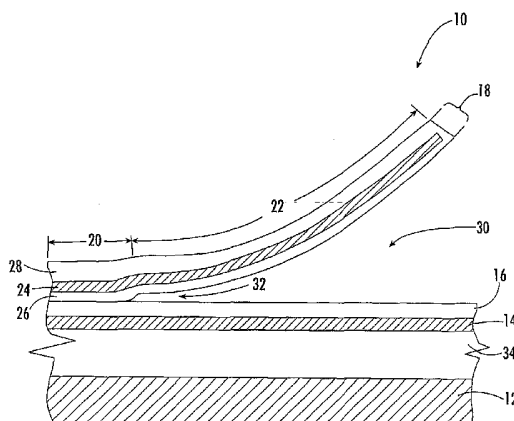
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(54) Title: DISTRIBUTED MEMS ELECTROSTATIC PUMPING DEVICES



(57) Abstract: A MEMS pumping device driven by electrostatic forces comprises a substrate having at least one substrate electrode disposed thereon. Affixed to the substrate is a moveable membrane that generally overlies the at least one substrate electrode. The moveable membrane comprises at least one electrode element and a biasing element. The moveable membrane includes a fixed portion attached to the substrate and distal portion extending from the fixed portion and being moveable with respect to the substrate electrode. A dielectric element is disposed between the at least one substrate electrode and the at least one electrode element of the moveable membrane to provide for electrical isolation. In operation, a voltage differential is established between the at least one substrate electrode and the at least one electrode element which displaces the moveable membrane relative to the substrate to thereby controllably distribute matter residing between the substrate and the distal portion of the moveable membrane. In a further embodiment the MEMS pumping devices comprise more than two moveable membranes that are configured so as to maximize flow in a desired direction. Additional embodiments include more than one electrode element disposed within the moveable membrane that are capable of individual and sequential biasing to improve overall net flow in the desired flow direction.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 F04D33/00

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)  
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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, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 536 963 A (POLLA DENNIS L) 16 July 1996 (1996-07-16) the whole document column 4, line 4 - line 52; figure 1	1, 38-41, 43
Y	WO 99 26333 A (MASSACHUSETTS INST TECHNOLOGY) 27 May 1999 (1999-05-27) the whole document claims 1,10; figures 1,9,10	1, 38-41, 43
A	US 5 861 703 A (LOSINSKI ARMAND) 19 January 1999 (1999-01-19) abstract; figures 3-5	1, 38-41, 43

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Information on patent family members

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