

(21) Application No: 1612578.3
(22) Date of Filing: 19.12.2014
Date Lodged: 20.07.2016
(30) Priority Data:
(31) 61919193 (32) 20.12.2013 (33) US
(86) International Application Data:
PCT/US2014/071611 En 19.12.2014
(87) International Publication Data:
WO2015/138034 En 17.09.2015

(51) INT CL:
C12N 5/07 (2010.01) C12M 3/00 (2006.01)
C12N 5/00 (2006.01)
(56) Documents Cited:
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(58) Field of Search:
INT CL A61K, B01L, C12M, C12N
Other: PatBase, Google Patents, Google Scholar

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(54) Title of the Invention: **Low shear microfluidic devices and methods of use and manufacturing thereof**
Abstract Title: **Low shear microfluidic devices and methods of use and manufacturing thereof**

(57) Provided herein relates to systems and methods for producing and using a body having a central channel separated by one or more membranes. The membrane(s) are configured to divide the central channel into at least one mesochannel and at least one microchannel. The height of the mesochannel is substantially greater than the height of the microchannel. A gaseous fluid can be applied through the mesochannel while a liquid fluid flowing through the microchannel. The systems and methods described herein can be used for various applications, including, e.g., growth and differentiation of primary cells such as human lung cells, as well as any other cells requiring low shear and/or stratified structures, or simulation of a microenvironment in living tissues and/or organs (to model physiology or disease states, and/or to identify therapeutic agents and/or vaccines). The systems and methods can also permit co-culture with one or more different cell types.

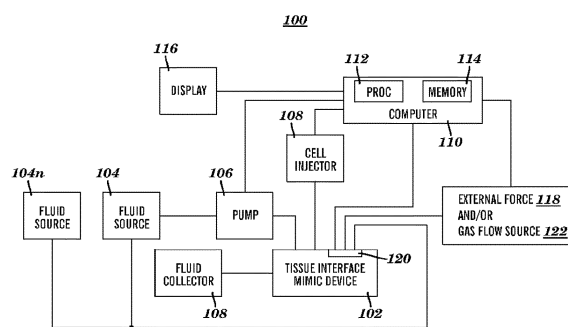


FIG. 1