



US 20220377942A1

(19) **United States**(12) **Patent Application Publication**  
**Gao**(10) **Pub. No.: US 2022/0377942 A1**(43) **Pub. Date: Nov. 24, 2022**(54) **MULTIPLE CHANNELS BASED COOLING  
DEVICE FOR CHIPS**(71) Applicant: **Baidu USA LLC**, Sunnyvale, CA (US)(72) Inventor: **Tianyi Gao**, Sunnyvale, CA (US)(21) Appl. No.: **17/326,850**(22) Filed: **May 21, 2021****Publication Classification**(51) **Int. Cl.****H05K 7/20** (2006.01)**H01L 23/427** (2006.01)(52) **U.S. Cl.**CPC ..... **H05K 7/20336** (2013.01); **H01L 23/427**  
(2013.01); **H05K 7/20327** (2013.01); **H05K**  
**7/20318** (2013.01); **H05K 7/20309** (2013.01)

(57)

**ABSTRACT**

A multi-channel cold plate for cooling chip wherein a first set of cooling channels function as main cooling channels and a second set of cooling channels function as a secondary and/or backup cooling channels. The two sets of cooling channels are fluidly isolated from each other, such that cooling fluid from one set of channels cannot flow or intermix with the cooling fluid of the other cooling channel. The secondary cooling channels can be operated when demand for heat removal is increased or when the main cooling channels is unable to manage the thermal condition of the chip properly.

