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**Su et al.**

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(54) **COMPUTER-IMPLEMENTED SIMULATION METHOD AND NON-TRANSITORY COMPUTER MEDIUM FOR USE IN MOLDING PROCESS**

(71) Applicant: **CORETECH SYSTEM CO., LTD.**,  
Hsinchu County (TW)

(72) Inventors: **Tung Huan Su**, Hsinchu County (TW);  
**Hsien Sen Chiu**, Hsinchu County (TW);  
**Rong Yeu Chang**, Hsinchu County (TW);  
**Chia Hsiang Hsu**, Hsinchu County (TW);  
**Ching Chang Chien**, Hsinchu County (TW);  
**Chih Chung Hsu**, Hsinchu County (TW)

(73) Assignee: **CORETECH SYSTEM CO., LTD.**,  
Hsinchu County (TW)

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(58) **Field of Classification Search**  
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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,097,432 A *	3/1992	Harada	.....	B29C 45/7693	164/457
5,296,174 A *	3/1994	Yakemoto	.....	B29C 45/78	264/328.1
5,411,686 A *	5/1995	Hata	.....	B29C 45/78	264/328.14
5,756,017 A *	5/1998	Togawa	.....	B29C 45/77	264/319
2004/0140579 A1 *	7/2004	Uwaji	.....	B29C 45/7693	264/40.1

FOREIGN PATENT DOCUMENTS

JP 2000289076 A \* 10/2000

OTHER PUBLICATIONS

Machine Translation of JP 2000289076 A (Oct. 2000).\*  
Heat flux. (Feb. 11, 2016). In Wikipedia, The Free Encyclopedia. Retrieved 07:00, Mar. 1, 2016.\*

(Continued)

*Primary Examiner* — Ryan Jarrett

(74) *Attorney, Agent, or Firm* — WPAT, P.C., International Property Attorneys; Anthony King

(57) **ABSTRACT**

A molding method includes the steps of specifying a simulating domain having a resin part and a mold part, wherein the simulating domain corresponds to a genuine domain on a molding machine; setting an initial resin temperature of the resin part and an initial mold temperature of the mold part; performing a transient state analysis to calculate a plurality of temperature distributions at different times between the resin part and the mold part; calculating at least one heat transfer coefficient between the resin part and the mold part taking into consideration the plurality of temperature distributions at different times; simulating the molding process of a molding resin that is injected into the simulating domain by using the at least one heat transfer coefficient to generate a plurality of molding conditions; and performing the molding process by using the plurality of molding conditions to the genuine domain on the molding machine.

**13 Claims, 18 Drawing Sheets**

