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(12) **United States Patent**
Schairer et al.(10) **Patent No.:** **US 8,290,246 B1**(45) **Date of Patent:** **Oct. 16, 2012**(54) **PHOTOGRAMMETRIC RECESSION MEASUREMENTS OF AN ABLATING SURFACE**(75) Inventors: **Edward T. Schairer**, Palo Alto, CA (US); **James T. Heineck**, San Jose, CA (US)(73) Assignee: **The United States of America as Represented by the Administrator of the National Aeronautics & Space Administration (NASA)**, Washington, DC (US)

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(21) Appl. No.: **11/958,296**(22) Filed: **Dec. 17, 2007**(51) **Int. Cl.**
G06K 9/00 (2006.01)(52) **U.S. Cl.** **382/154; 348/47; 356/601**(58) **Field of Classification Search** **382/154; 348/47; 356/601, 603**

See application file for complete search history.

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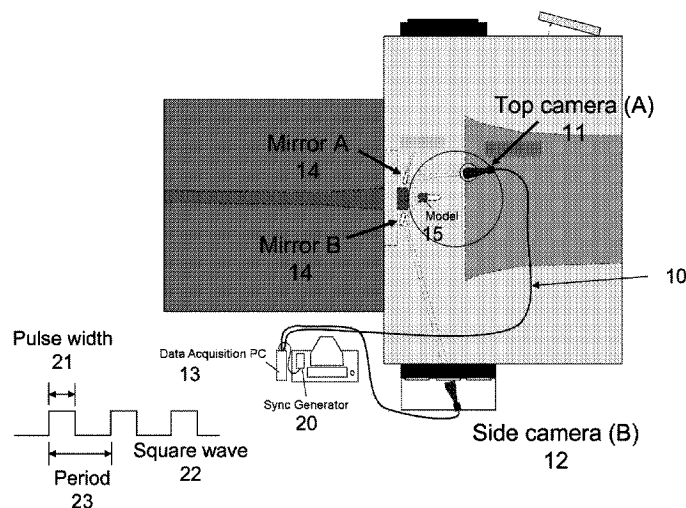
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Primary Examiner — Gregory M Desire(74) *Attorney, Agent, or Firm* — John F. Schipper; Robert M. Padilla(57) **ABSTRACT**

An instrument and method for measuring the time history of recession of an ablating surface of a test article during testing in a high enthalpy thermal test facility, such as an arcjet. The method advances prior art by providing time-history data over the full ablating surface without targets and without any modifications to the test article. The method is non-intrusive, simple to implement, requires no external light source, and does not interfere with normal operations of the arcjet facility.

9 Claims, 8 Drawing Sheets

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FIG. 1

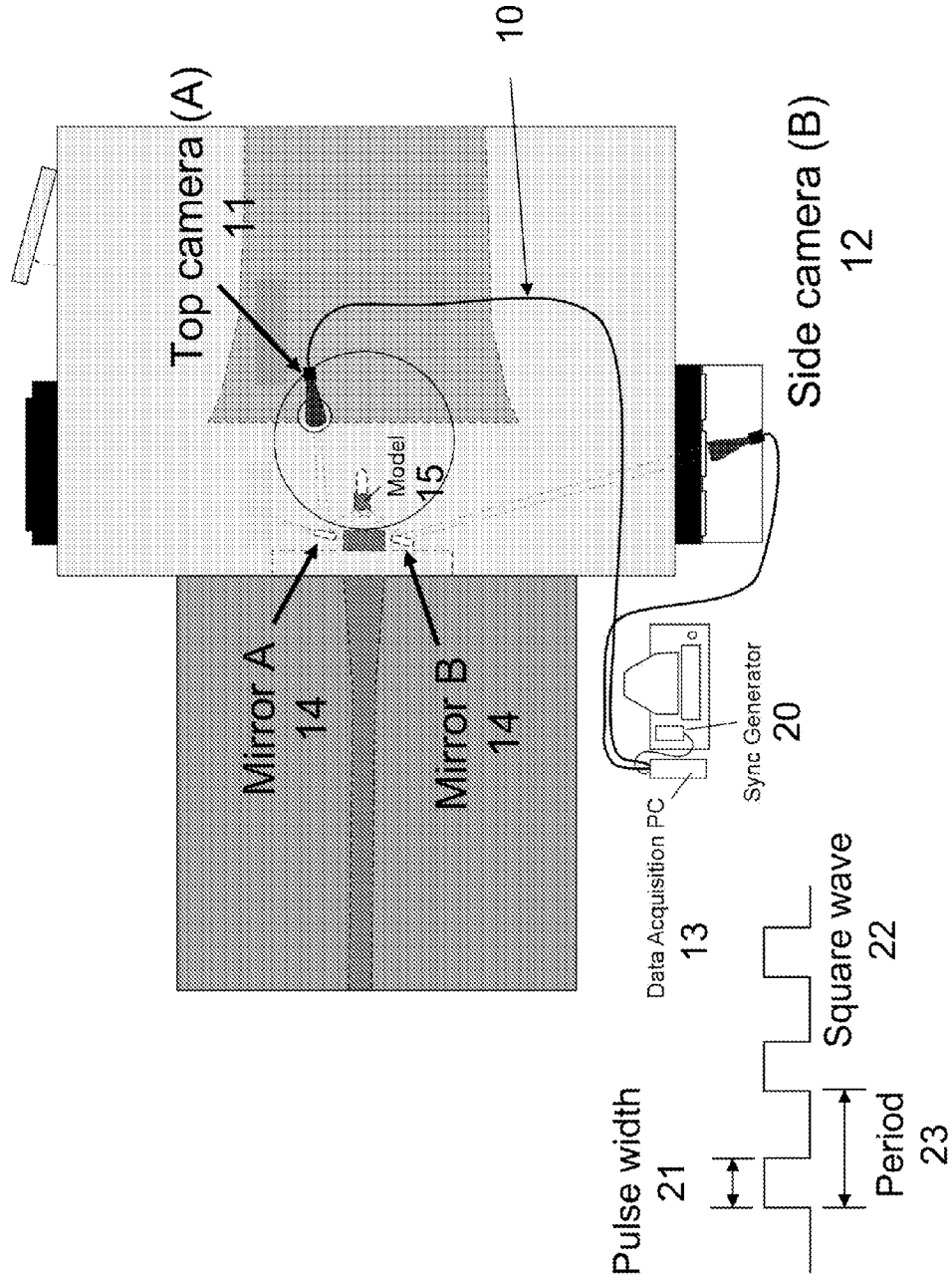


FIG. 2

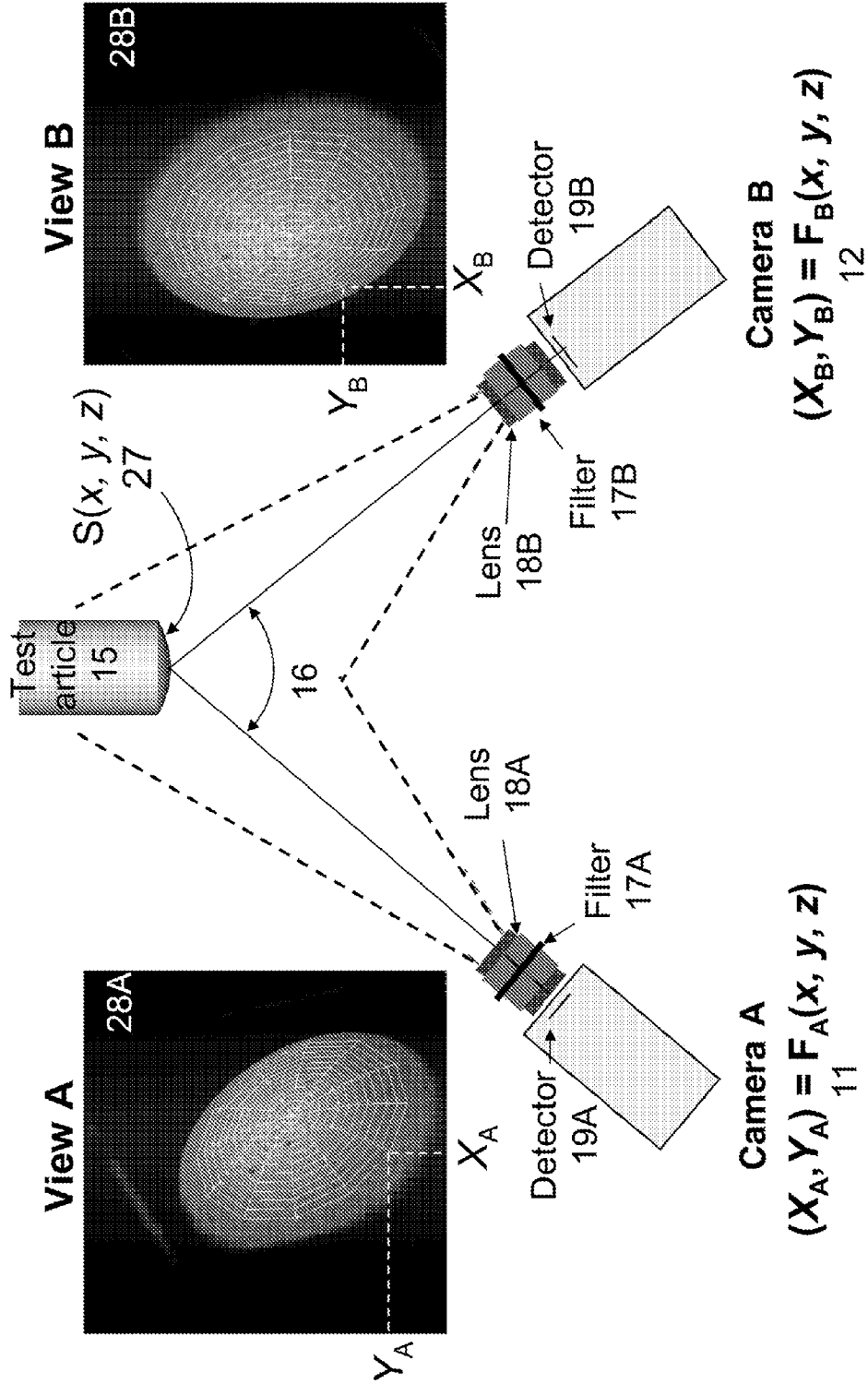


FIG. 3

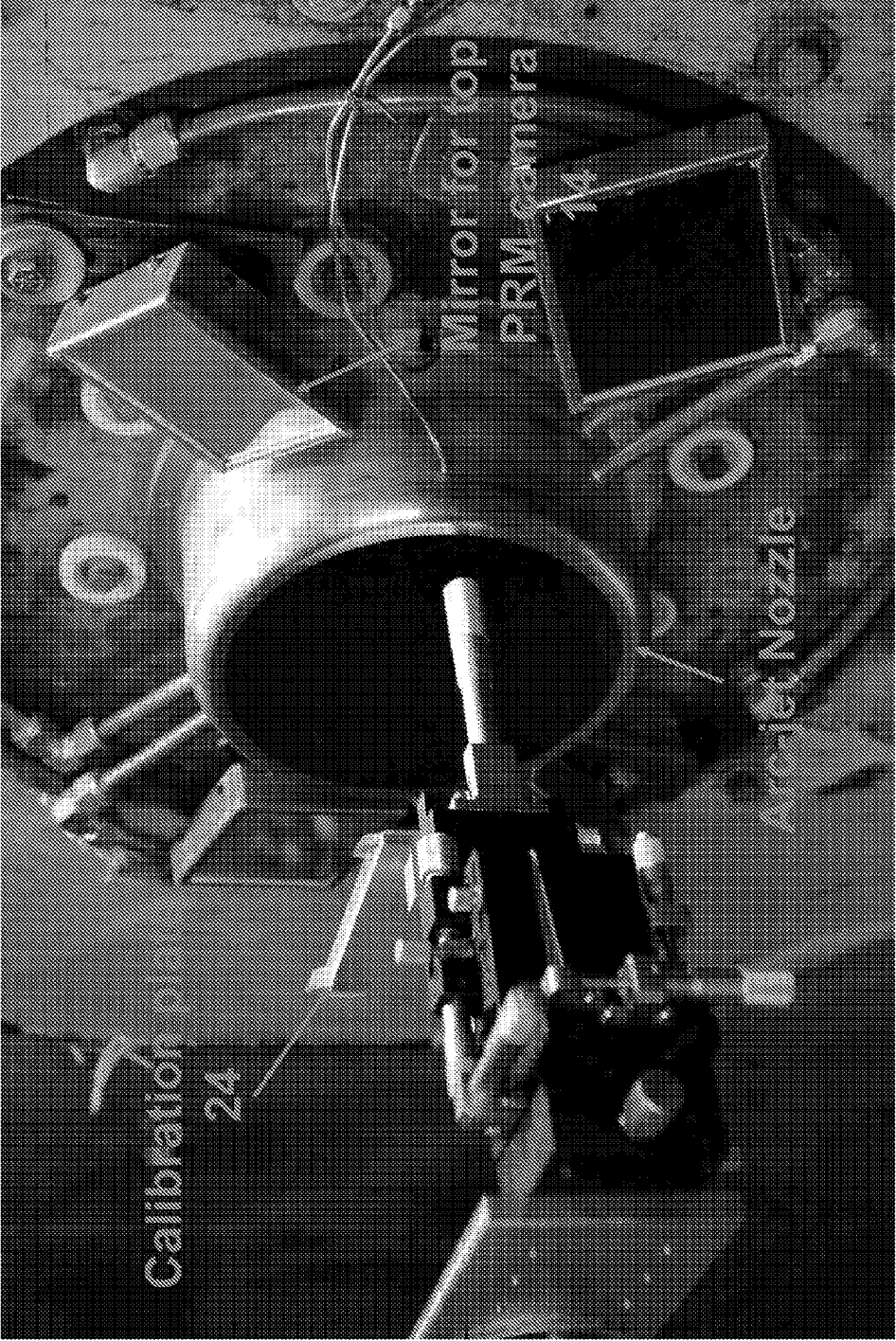
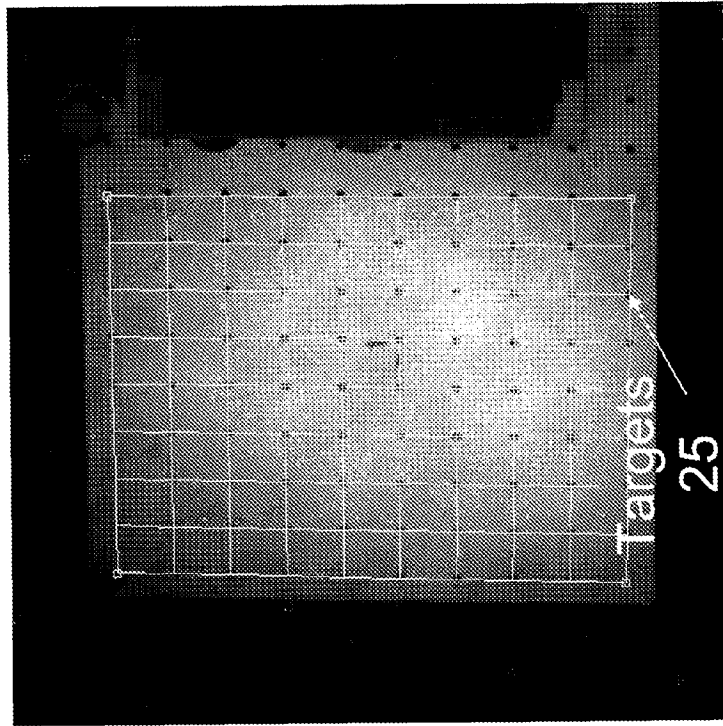


FIG. 4A

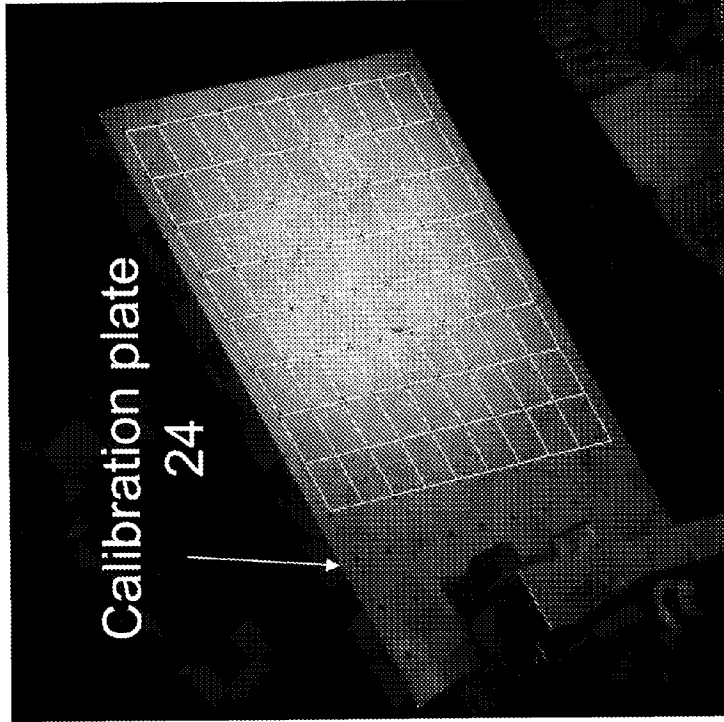
FIG. 4B

Calibration images

26



Side camera



Top camera

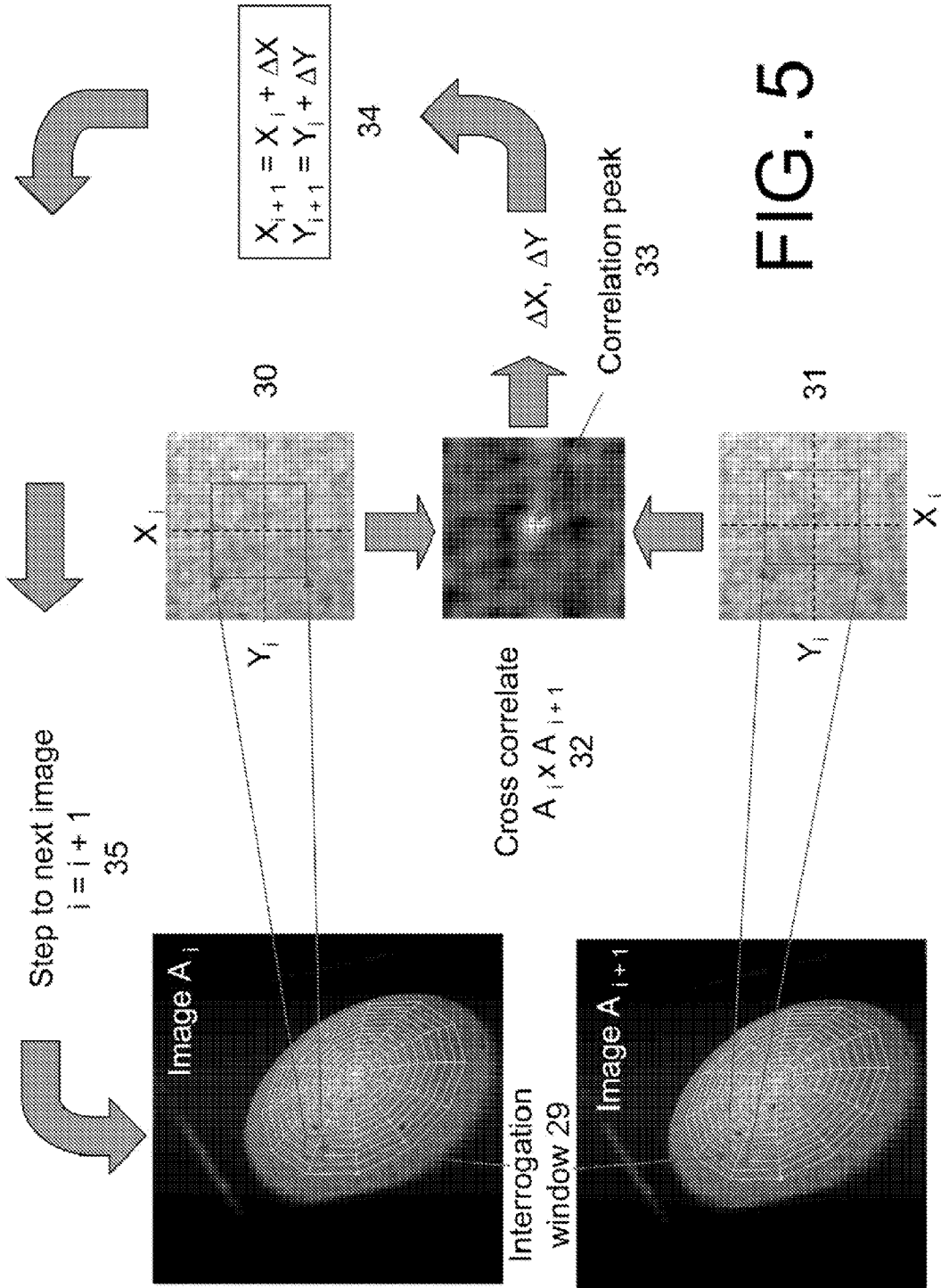


FIG. 5

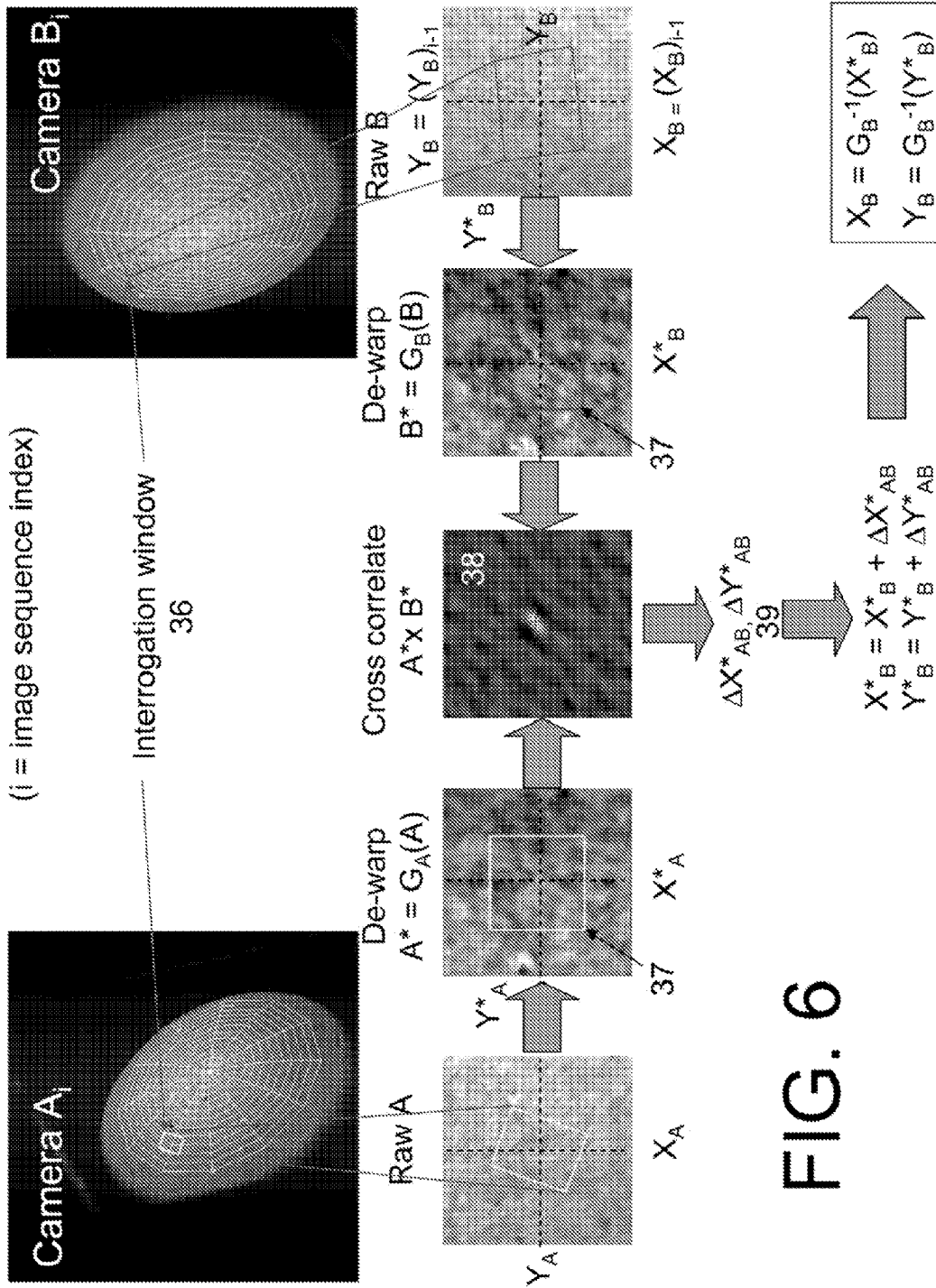


FIG. 6

FIG. 7

FIG. 7A
Raw
images

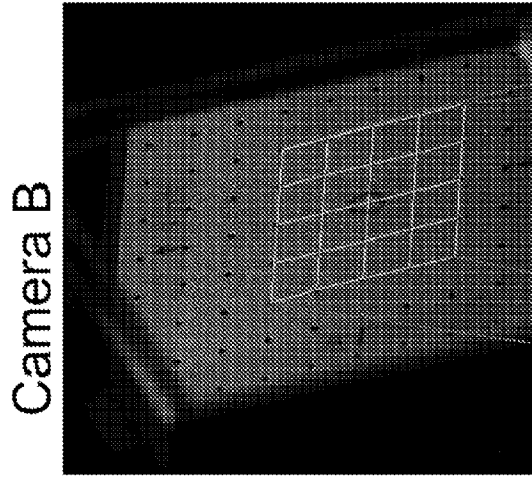
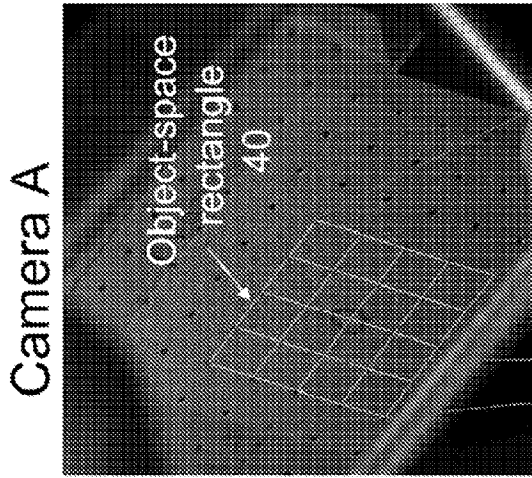


FIG. 7B

FIG. 7C
Globally
de-warped
Images
42

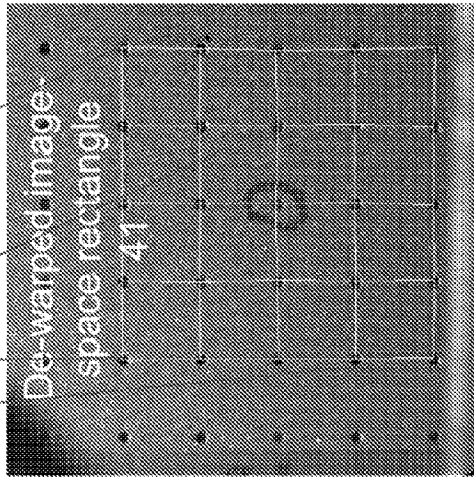
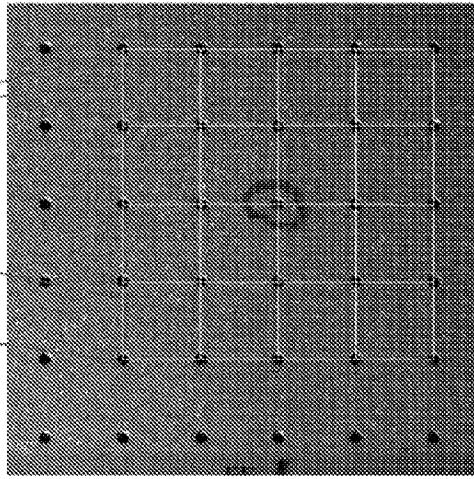


FIG. 7D



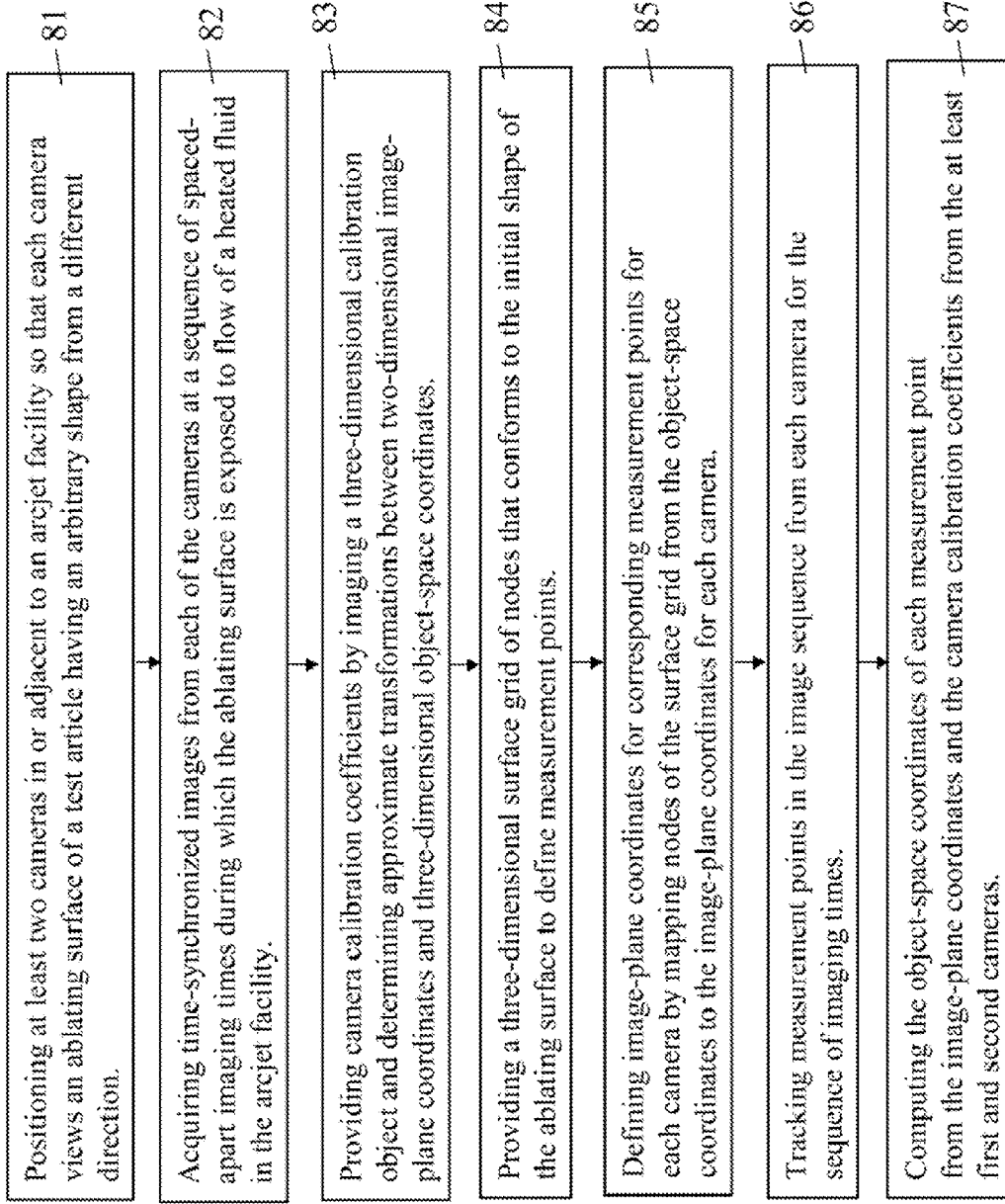


FIG. 8