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(54) **MATTRESS HEALTH MONITORING**

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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

7,107,642 B2 * 9/2006 Wong A47C 27/082 5/713
2006/0271207 A1 * 11/2006 Shaw A61G 7/05776 700/17
(Continued)

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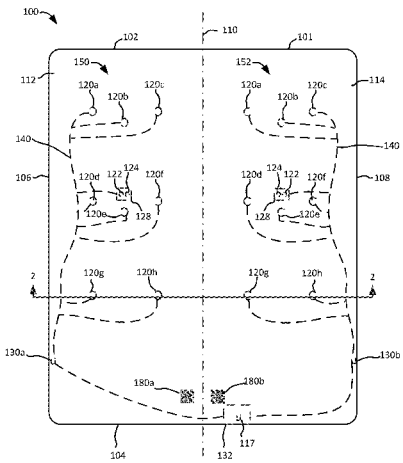
(57) **ABSTRACT**

Sleep systems having embedded sensors are described. In one aspect, a sleep system includes a mattress and one or more force sensors embedded within the mattress. The force sensors are positioned within the mattress to sense movement of an occupant of the mattress. The sleep system also includes one or more processors coupled with the one or more force sensors. At least one of the processors is configured to determine sleep state information for the occupant based on data obtained from one or more of the force sensors.

20 Claims, 18 Drawing Sheets