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Breed et al.

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(54) **VEHICULAR MONITORING SYSTEMS USING IMAGE PROCESSING**

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Related U.S. Application Data

(63) Continuation-in-part of application No. 10/116,808, filed on Apr. 5, 2002, which is a continuation-in-part of application No. 09/925,043, filed on Aug. 8, 2001, now Pat. No. 6,507,779, which is a continuation-in-part of application No. 09/765,559, filed on Jan. 19, 2001, now Pat. No. 6,553,296, and a continuation-in-part of application No. 09/389,947, filed on Sep. 3, 1999, now Pat. No. 6,393,133, and a continuation-in-part of application No. 09/838,919, filed on Apr. 20, 2001, now Pat. No. 6,442,465, which is a continuation-in-part of application No. 09/765,559, which is a continuation-in-part of application No. 09/476,255, filed on Dec. 30, 1999, now Pat. No. 6,324,453, and a continuation-in-part of application No. 09/389,947, which is a continuation-in-part of application No. 09/200,614, filed on Nov. 30, 1998, now Pat. No. 6,141,432, which is a continuation of application No. 08/474,786, filed on Jun. 7, 1995, now Pat. No. 5,845,000.

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(51) **Int. Cl.**[7] **B60R 21/32**

(52) **U.S. Cl.** **701/45**; 340/573.1; 348/77; 180/271; 280/735; 382/181

(58) **Field of Search** 701/45, 36, 301; 340/461, 435, 436, 438, 815.4, 573.1; 348/148, 77, 154; 180/271; 280/735, 728.1; 382/181, 115, 190, 224, 100, 104

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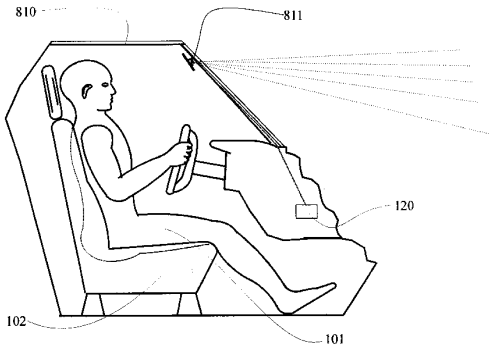
(57) **ABSTRACT**

Vehicular monitoring arrangement for monitoring an environment of the vehicle including at least one active pixel camera for obtaining images of the environment of the vehicle and a processor coupled to the active pixel camera(s) for determining at least one characteristic of an object in the environment based on the images obtained by the active pixel camera(s). The active pixel camera can be arranged in a headliner, roof or ceiling of the vehicle to obtain images of an interior environment of the vehicle, in an A-pillar or B-pillar of the vehicle to obtain images of an interior environment of the vehicle, or in a roof, ceiling, B-pillar or C-pillar of the vehicle to obtain images of an interior environment of the vehicle behind a front seat of the vehicle. The determined characteristic can be used to enable optimal control of a reactive component, system or subsystem coupled to the processor. When the reactive component is an airbag assembly including at least one airbag, the processor can be designed to control at least one deployment parameter of the airbag(s).

86 Claims, 19 Drawing Sheets



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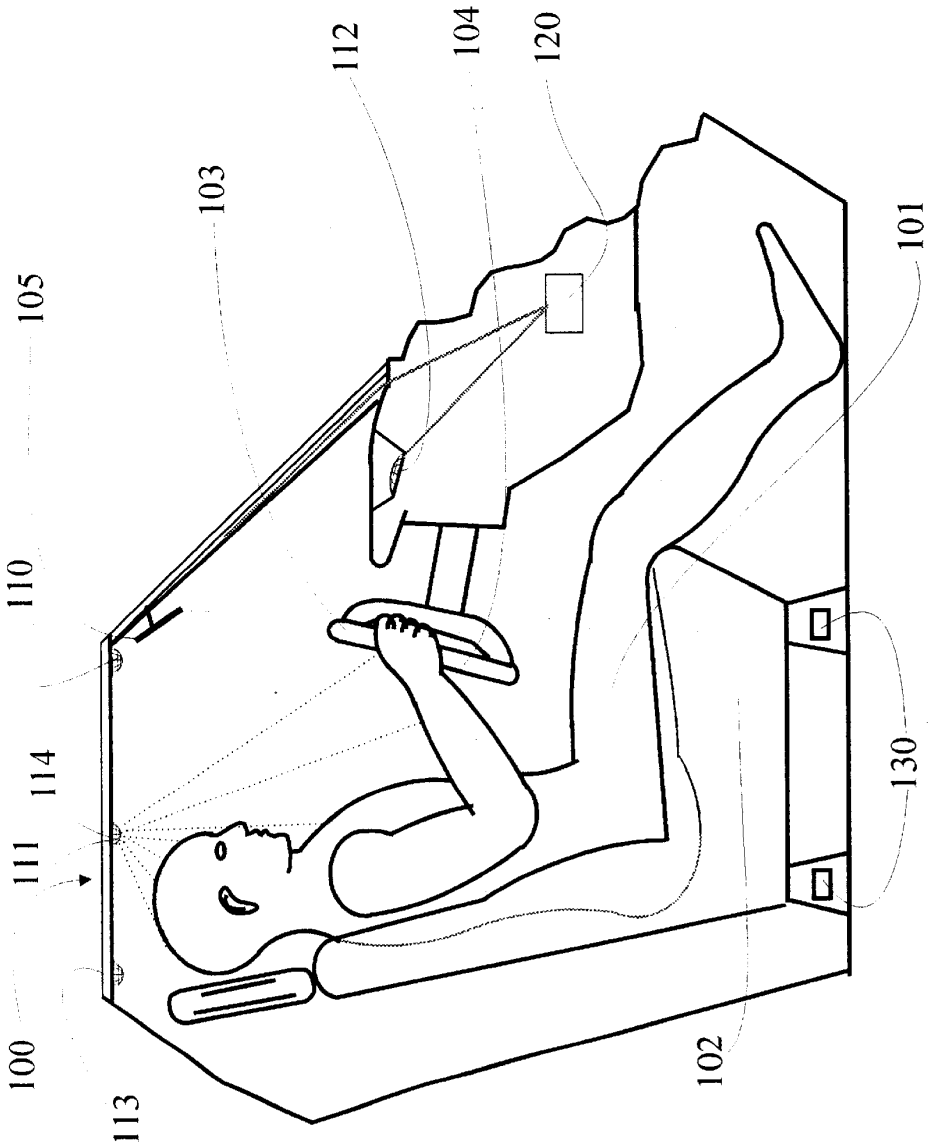

FIG. 1A

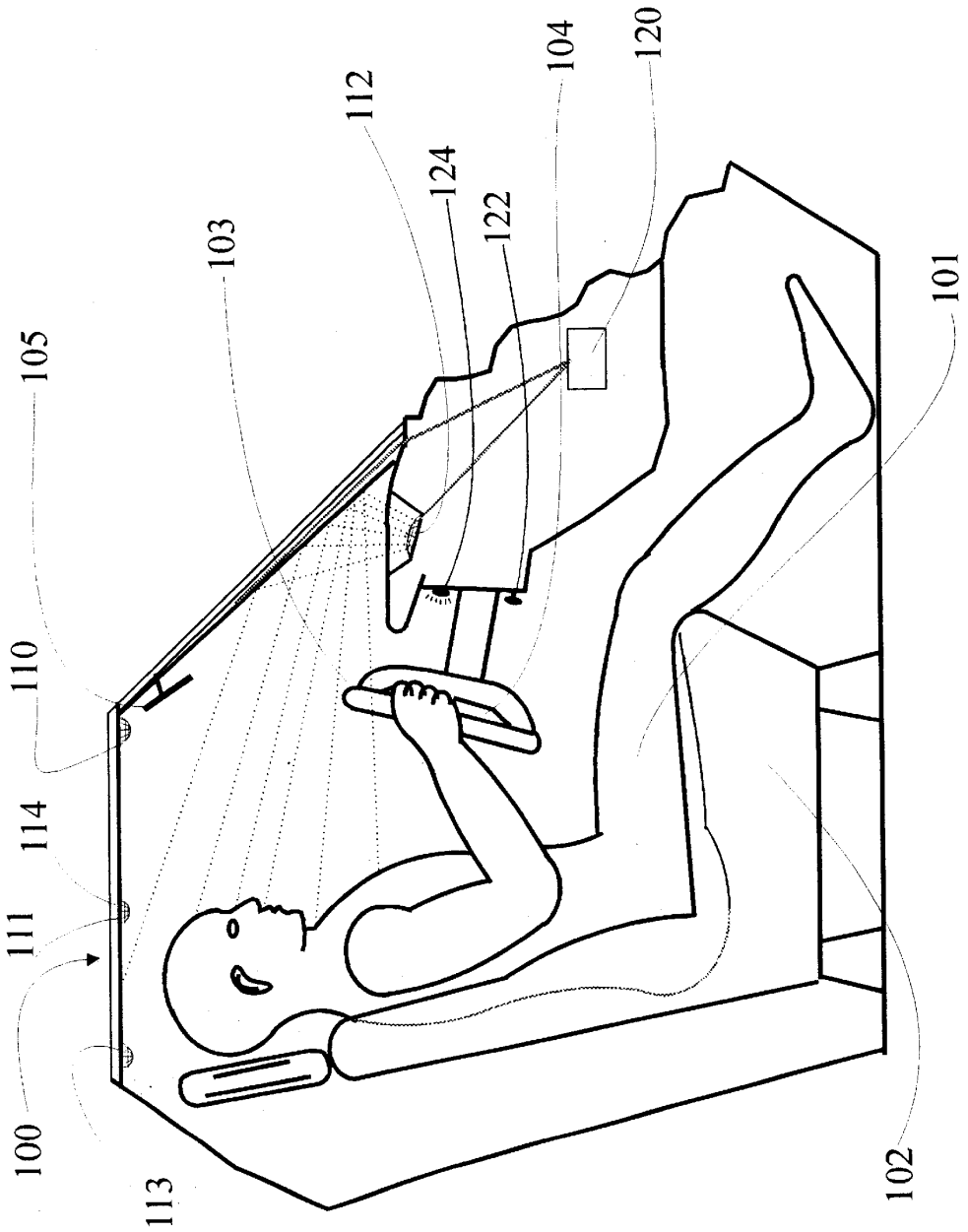

FIG. 1B

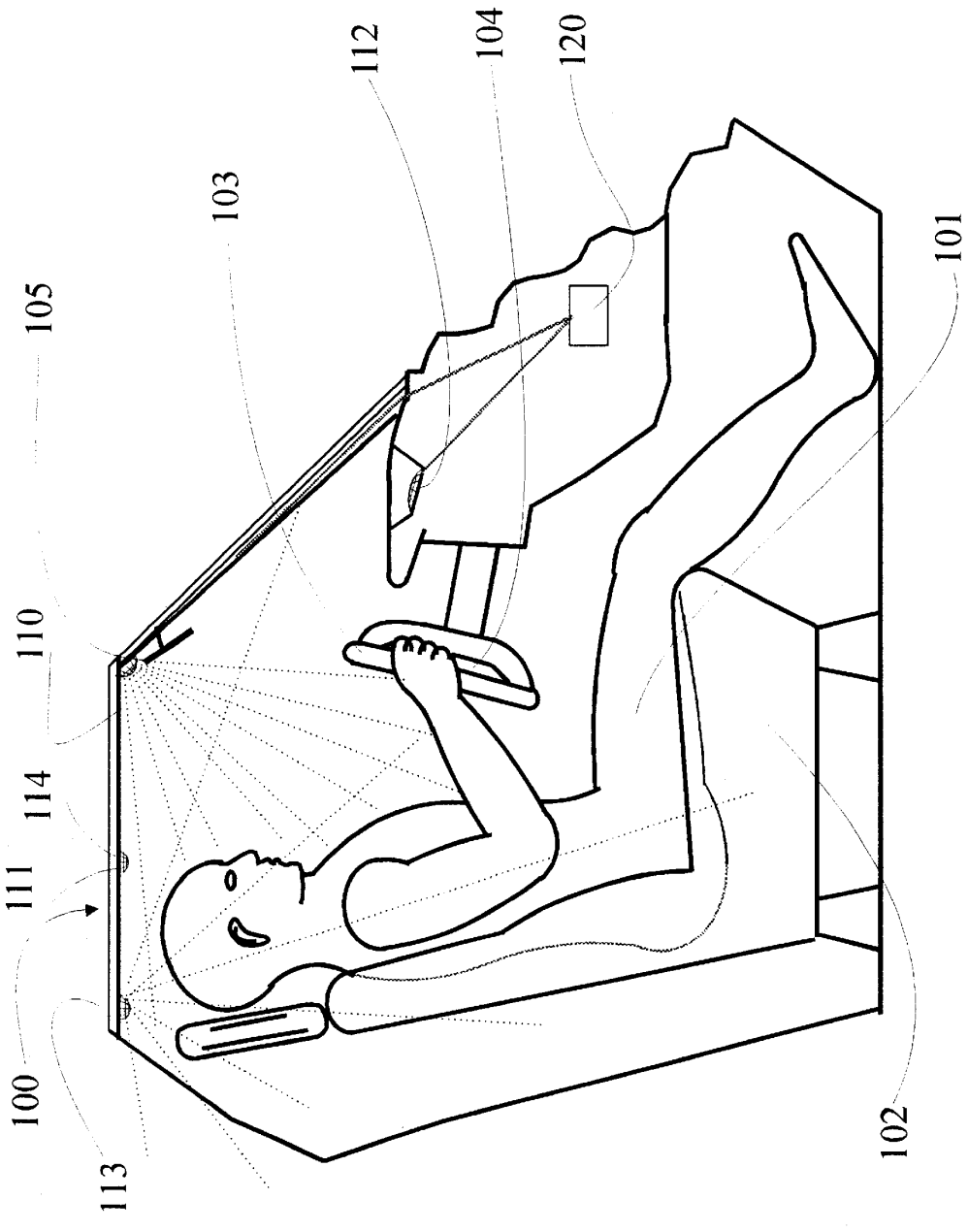

FIG. 1C

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