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United States Patent [19]

Breed et al.

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[45] **Date of Patent: *Dec. 1, 1998**

[54] **OPTICAL IDENTIFICATION AND MONITORING SYSTEM USING PATTERN RECOGNITION FOR USE WITH VEHICLES**

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[73] Assignee: **Automotive Technologies International, Inc.**, Denville, N.J.

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,835,613.

[21] Appl. No.: **474,786**

[22] Filed: **Jun. 7, 1995**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 878,571, May 5, 1992, abandoned, Ser. No. 40,978, Mar. 31, 1993, abandoned, Ser. No. 247,760, May 23, 1994, and Ser. No. 239,978, May 9, 1994, abandoned.

[51] **Int. Cl.**[6] **G06K 9/00**

[52] **U.S. Cl.** **382/100**; 348/143

[58] **Field of Search** 340/436; 382/104, 382/103, 291, 100; 280/735; 348/143, 148

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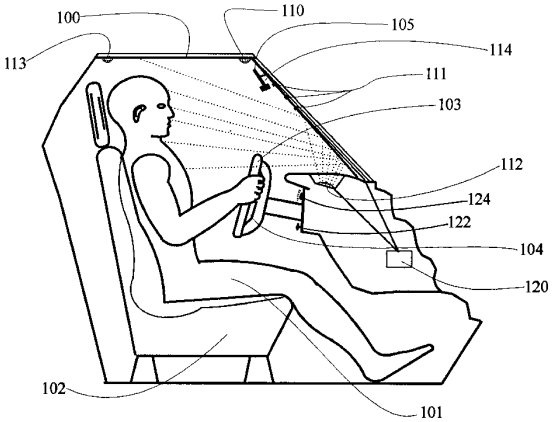
Primary Examiner—Yon J. Couso

[57] **ABSTRACT**

A vehicle interior monitoring system to identify, locate and monitor occupants, including their parts, and other objects in the passenger compartment and objects outside of a motor vehicle, such as an automobile or truck, by illuminating the contents of the vehicle and objects outside of the vehicle with electromagnetic, and specifically infrared, radiation and using one or more lenses to focus images of the contents onto one or more arrays of charge coupled devices (CCD arrays). Outputs from the CCD arrays, are analyzed by appropriate computational means employing trained pattern recognition technologies, to classify, identify or locate the contents or external objects. In general, the information obtained by the identification and monitoring system is used to affect the operation of some other system in the vehicle. When system is installed in the passenger compartment of an automotive vehicle equipped with an airbag, the system determines the position of the vehicle occupant relative to the airbag and disables deployment of the airbag if the occupant is positioned so that he/she is likely to be injured by the deployment of the airbag.

25 Claims, 12 Drawing Sheets



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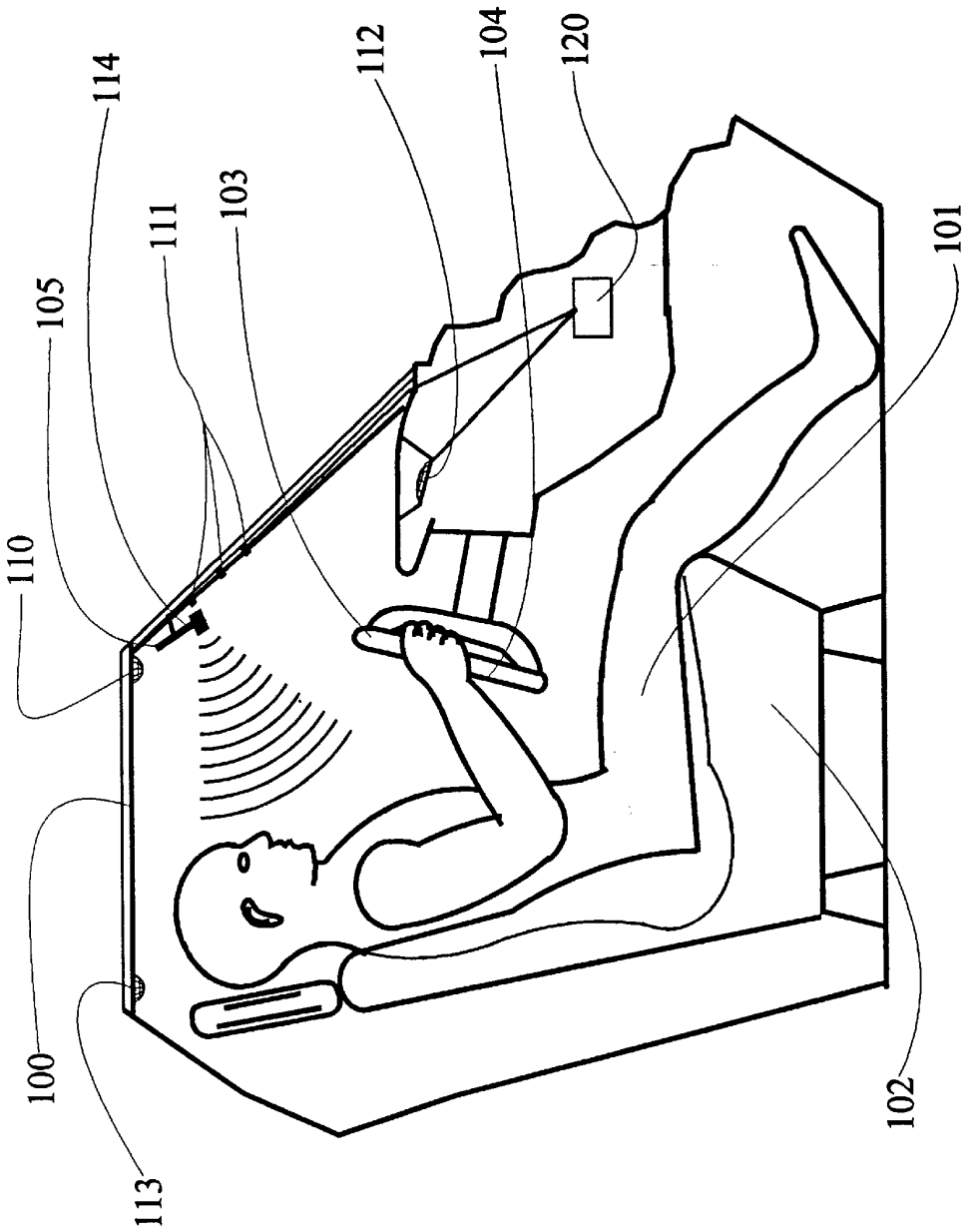

FIG. 1A

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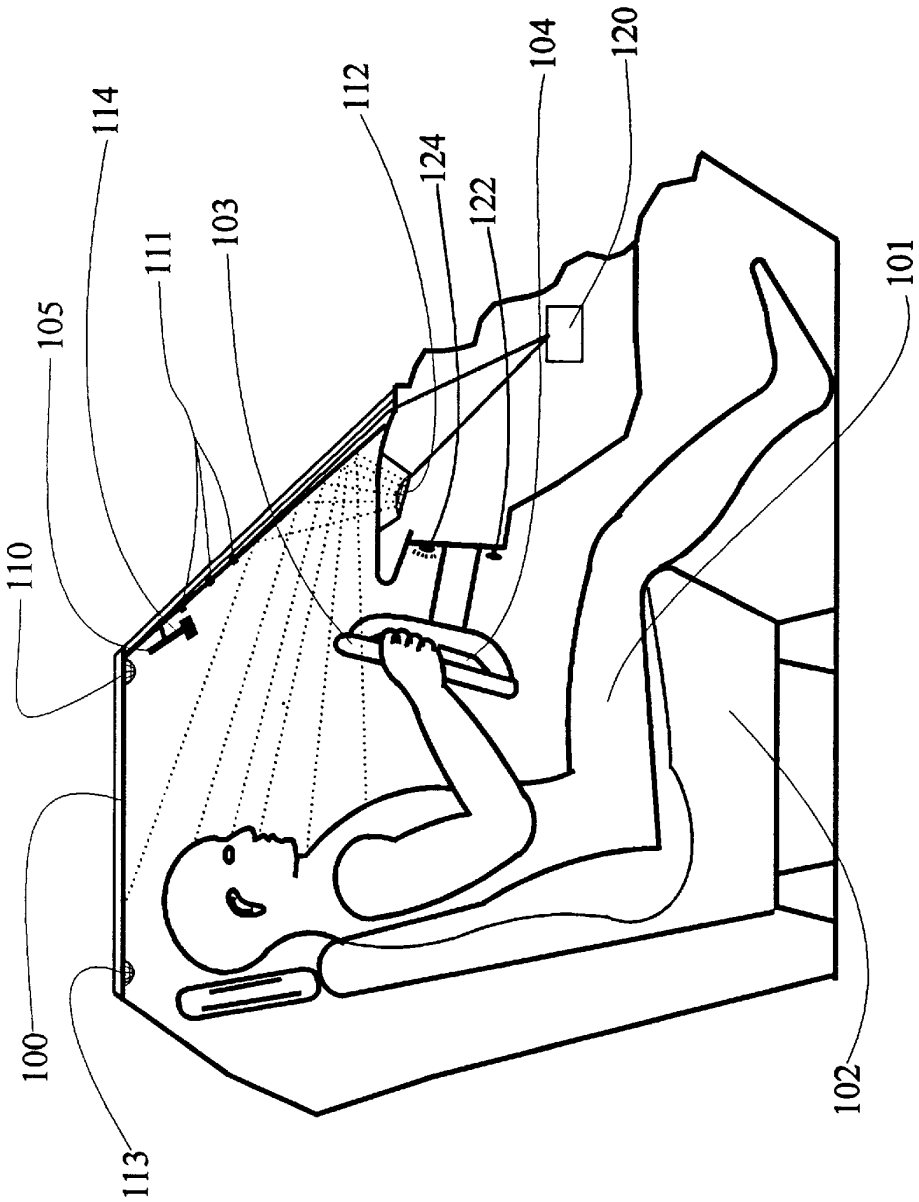

FIG. 1B

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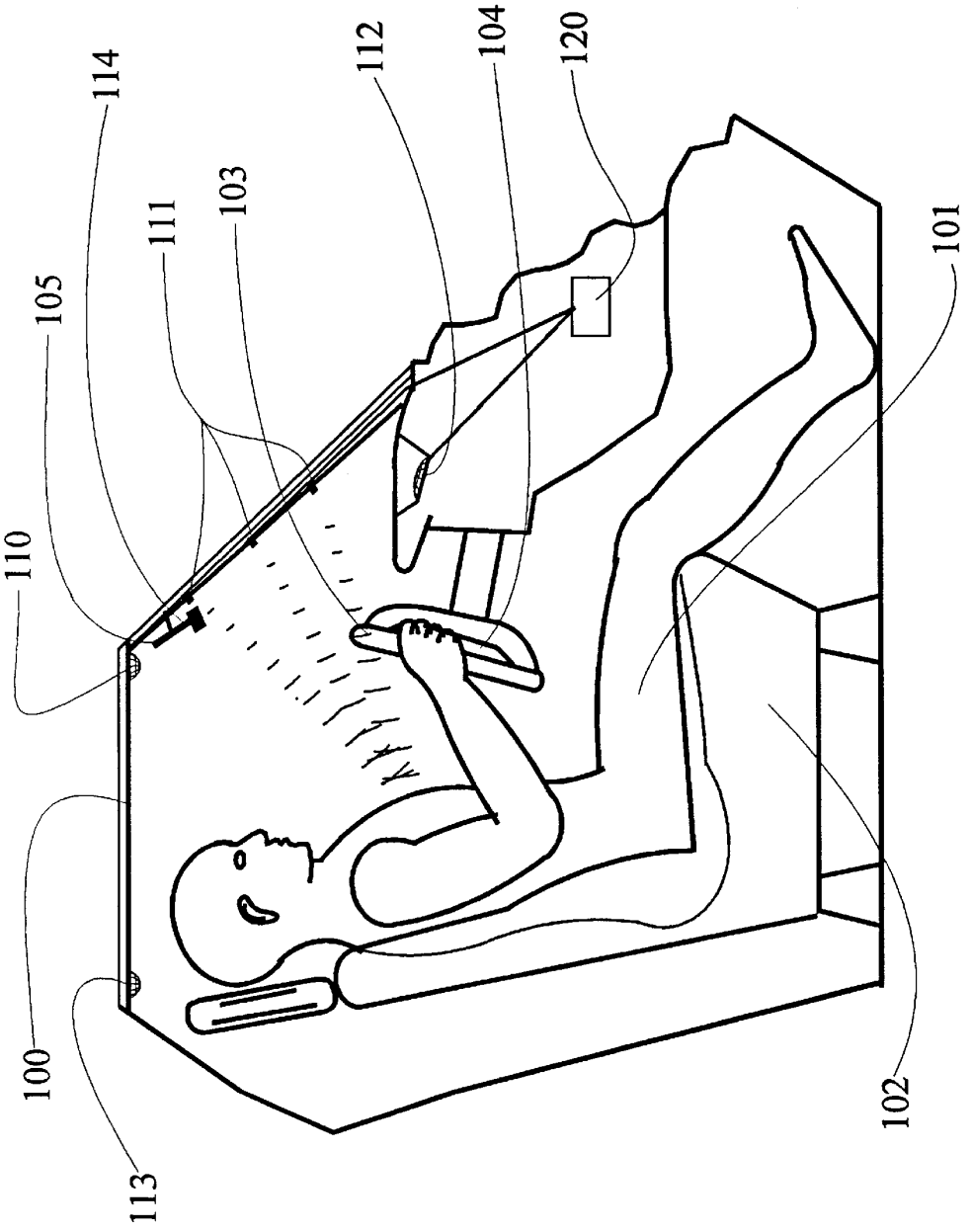

FIG. 1C

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