



US005566067A

United States Patent [19]

[11] **Patent Number:** **5,566,067**

Hobson et al.

[45] **Date of Patent:** **Oct. 15, 1996**

[54] **EYELID VIGILANCE DETECTOR SYSTEM**

5,137,345 8/1992 Waldorf et al. 351/206
5,402,109 3/1995 Mannik 340/575

[75] Inventors: **J. Alan Hobson**, Brookline; **Robert A. Stickgold**, Cambridge, both of Mass.

Primary Examiner—Emanuel T. Voeltz
Assistant Examiner—Thomas Peeso
Attorney, Agent, or Firm—Wolf, Greenfield & Sacks, P.C.

[73] Assignee: **The President and Fellows of Harvard College**, Cambridge, Mass.

[57] **ABSTRACT**

[21] Appl. No.: **410,125**

A vigilance monitoring system and method provides an alarm signal to a subject at an early stage of vigilance loss. The system includes a sensor, preferable made from a piezoelectric material, attached to the eyelid of the subject, that produces an electric signal in response to each eyelid movement, wherein the strength of the signal depends on the magnitude of the eyelid movement. A processor, electrically coupled to the sensor, monitors the frequency of electric signals received having a signal strength above a threshold level corresponding to a small active eyelid movement, and produces an output signal if the frequency of received electric signals having the signal strength above the threshold level is less than a predetermined frequency. The output signal preferably includes an audio alarm signal provided to an output loudspeaker. The processor preferably includes a signal recording circuit and a programmable microprocessor, wherein the signal recording circuit is electrically connected to the sensor and/or the microprocessor.

[22] Filed: **Mar. 23, 1995**

[51] **Int. Cl.⁶** **G01S 13/74**

[52] **U.S. Cl.** **364/419.2; 340/575**

[58] **Field of Search** 364/569, 419.2,
364/550, 551.01; 340/575, 825.06, 825.15;
128/639, 640, 653.5

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,689,135	9/1972	Young et al.	351/39
3,863,243	1/1975	Skolnick et al.	340/279
4,144,531	3/1979	Anbergen	340/575
4,359,724	11/1982	Zimmerman et al.	340/575
4,524,776	6/1985	Withers et al.	128/644
4,585,011	4/1986	Broughton et al.	128/733
4,836,219	6/1989	Hobson et al.	128/782
4,953,111	8/1990	Yamamoto et al.	364/569
4,967,186	10/1990	Ludmirsky et al.	340/575

14 Claims, 4 Drawing Sheets

