



US010373143B2

(12) **United States Patent**
Todeschini

(10) **Patent No.: US 10,373,143 B2**
(45) **Date of Patent: Aug. 6, 2019**

(54) **PRODUCT IDENTIFICATION USING ELECTROENCEPHALOGRAPHY**

(56) **References Cited**

U.S. PATENT DOCUMENTS

- (71) Applicant: **Hand Held Products, Inc.**, Fort Mill, SC (US)
- (72) Inventor: **Erik Todeschini**, Camillus, NY (US)
- (73) Assignee: **Hand Held Products, Inc.**, Fort Mill, SC (US)

- 6,832,725 B2 12/2004 Gardiner et al.
- 7,128,266 B2 10/2006 Zhu et al.
- 7,159,783 B2 1/2007 Walczyk et al.
- 7,413,127 B2 8/2008 Ehrhart et al.
- 7,726,575 B2 6/2010 Wang et al.
- 8,294,969 B2 10/2012 Plesko
- 8,317,105 B2 11/2012 Kotlarsky et al.
- 8,322,622 B2 12/2012 Liu et al.
- 8,366,005 B2 2/2013 Kotlarsky et al.

(Continued)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 691 days.

FOREIGN PATENT DOCUMENTS

(21) Appl. No.: **14/863,681**

- WO 2013163789 A1 11/2013
- WO 2013173985 A1 11/2013

(Continued)

(22) Filed: **Sep. 24, 2015**

OTHER PUBLICATIONS

(65) **Prior Publication Data**
US 2017/0091741 A1 Mar. 30, 2017

Combined Search and Examination Report in counterpart GB Application No. 1615457.7 dated Feb. 21, 2017, pp. 1-7.

(Continued)

(51) **Int. Cl.**
G06Q 20/00 (2012.01)
G06Q 20/20 (2012.01)
A61B 5/00 (2006.01)
A61B 5/0476 (2006.01)
A61B 5/16 (2006.01)
G07G 1/00 (2006.01)

Primary Examiner — Rokib Masud
(74) *Attorney, Agent, or Firm* — Additon, Higgins & Pendleton, P.A.

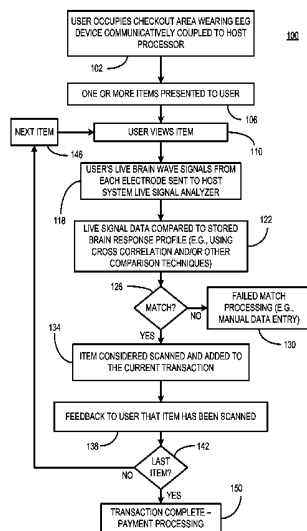
(57) **ABSTRACT**

An EEG POS system has an EEG device that detects electrical signals representing brain waves. A database of brain wave profiles represents a plurality of items to be identified. A live signal analyzer compares electrical signals from the EEG device with stored brain wave profiles in the database to identify entries in the database representing items that match the electrical signals from the EEG device, where items whose stored brain wave profiles match the electrical signals are considered identified items. A POS terminal is coupled to the live signal analyzer in order to log and tally items for a transaction.

(52) **U.S. Cl.**
CPC **G06Q 20/201** (2013.01); **A61B 5/0476** (2013.01); **A61B 5/16** (2013.01); **A61B 5/7264** (2013.01); **G06Q 20/208** (2013.01); **G07G 1/0036** (2013.01)

(58) **Field of Classification Search**
CPC G06Q 20/201; G06Q 10/087
USPC 705/20
See application file for complete search history.

13 Claims, 4 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

8,371,507 B2	2/2013	Haggerty et al.	D702,237 S	4/2014	Oberpriller et al.
8,376,233 B2	2/2013	Van Horn et al.	8,687,282 B2	4/2014	Feng et al.
8,381,979 B2	2/2013	Franz	8,692,927 B2	4/2014	Pease et al.
8,390,909 B2	3/2013	Plesko	8,695,880 B2	4/2014	Bremer et al.
8,408,464 B2	4/2013	Zhu et al.	8,698,949 B2	4/2014	Grunow et al.
8,408,468 B2	4/2013	Horn et al.	8,702,000 B2	4/2014	Barber et al.
8,408,469 B2	4/2013	Good	8,717,494 B2	5/2014	Gannon
8,424,768 B2	4/2013	Rueblinger et al.	8,720,783 B2	5/2014	Biss et al.
8,448,863 B2	5/2013	Xian et al.	8,723,804 B2	5/2014	Fletcher et al.
8,457,013 B2	6/2013	Essinger et al.	8,723,904 B2	5/2014	Marty et al.
8,459,557 B2	6/2013	Havens et al.	8,727,223 B2	5/2014	Wang
8,469,272 B2	6/2013	Kearney	8,740,082 B2	6/2014	Wilz
8,474,712 B2	7/2013	Kearney et al.	8,740,085 B2	6/2014	Furlong et al.
8,479,992 B2	7/2013	Kotlarsky et al.	8,746,563 B2	6/2014	Hennick et al.
8,490,877 B2	7/2013	Kearney	8,750,445 B2	6/2014	Peake et al.
8,517,271 B2	8/2013	Kotlarsky et al.	8,752,766 B2	6/2014	Xian et al.
8,523,076 B2	9/2013	Good	8,756,059 B2	6/2014	Braho et al.
8,528,818 B2	9/2013	Ehrhart et al.	8,757,495 B2	6/2014	Qu et al.
8,544,737 B2	10/2013	Gomez et al.	8,760,563 B2	6/2014	Koziol et al.
8,548,420 B2	10/2013	Grunow et al.	8,763,909 B2	7/2014	Reed et al.
8,550,335 B2	10/2013	Samek et al.	8,777,108 B2	7/2014	Coyle
8,550,354 B2	10/2013	Gannon et al.	8,777,109 B2	7/2014	Oberpriller et al.
8,550,357 B2	10/2013	Kearney	8,779,898 B2	7/2014	Havens et al.
8,556,174 B2	10/2013	Kosecki et al.	8,781,520 B2	7/2014	Payne et al.
8,556,176 B2	10/2013	Van Horn et al.	8,783,573 B2	7/2014	Havens et al.
8,556,177 B2	10/2013	Hussey et al.	8,789,757 B2	7/2014	Barten
8,559,767 B2	10/2013	Barber et al.	8,789,758 B2	7/2014	Hawley et al.
8,561,895 B2	10/2013	Gomez et al.	8,789,759 B2	7/2014	Xian et al.
8,561,903 B2	10/2013	Sauerwein	8,794,520 B2	8/2014	Wang et al.
8,561,905 B2	10/2013	Edmonds et al.	8,794,522 B2	8/2014	Ehrhart
8,565,107 B2	10/2013	Pease et al.	8,794,525 B2	8/2014	Amundsen et al.
8,571,307 B2	10/2013	Li et al.	8,794,526 B2	8/2014	Wang et al.
8,579,200 B2	11/2013	Samek et al.	8,798,367 B2	8/2014	Ellis
8,583,924 B2	11/2013	Caballero et al.	8,807,431 B2	8/2014	Wang et al.
8,584,945 B2	11/2013	Wang et al.	8,807,432 B2	8/2014	Van Horn et al.
8,587,595 B2	11/2013	Wang	8,820,630 B2	9/2014	Qu et al.
8,587,697 B2	11/2013	Hussey et al.	8,822,848 B2	9/2014	Meagher
8,588,869 B2	11/2013	Sauerwein et al.	8,824,692 B2	9/2014	Sheerin et al.
8,590,789 B2	11/2013	Nahill et al.	8,824,696 B2	9/2014	Braho
8,596,539 B2	12/2013	Havens et al.	8,842,849 B2	9/2014	Wahl et al.
8,596,542 B2	12/2013	Havens et al.	8,844,822 B2	9/2014	Kotlarsky et al.
8,596,543 B2	12/2013	Havens et al.	8,844,823 B2	9/2014	Fritz et al.
8,599,271 B2	12/2013	Havens et al.	8,849,019 B2	9/2014	Li et al.
8,599,957 B2	12/2013	Peake et al.	D716,285 S	10/2014	Chaney et al.
8,600,158 B2	12/2013	Li et al.	8,851,383 B2	10/2014	Yeakley et al.
8,600,167 B2	12/2013	Showering	8,854,633 B2	10/2014	Laffargue
8,602,309 B2	12/2013	Longacre et al.	8,866,963 B2	10/2014	Grunow et al.
8,608,053 B2	12/2013	Meier et al.	8,868,421 B2	10/2014	Braho et al.
8,608,071 B2	12/2013	Liu et al.	8,868,519 B2	10/2014	Maloy et al.
8,611,309 B2	12/2013	Wang et al.	8,868,802 B2	10/2014	Barten
8,615,487 B2	12/2013	Gomez et al.	8,868,803 B2	10/2014	Caballero
8,621,123 B2	12/2013	Caballero	8,870,074 B1	10/2014	Gannon
8,622,303 B2	1/2014	Meier et al.	8,879,639 B2	11/2014	Sauerwein
8,628,013 B2	1/2014	Ding	8,880,426 B2	11/2014	Smith
8,628,015 B2	1/2014	Wang et al.	8,881,983 B2	11/2014	Havens et al.
8,628,016 B2	1/2014	Winegar	8,881,987 B2	11/2014	Wang
8,629,926 B2	1/2014	Wang	8,903,172 B2	12/2014	Smith
8,630,491 B2	1/2014	Longacre et al.	8,908,995 B2	12/2014	Benos et al.
8,635,309 B2	1/2014	Berthiaume et al.	8,910,870 B2	12/2014	Li et al.
8,636,200 B2	1/2014	Kearney	8,910,875 B2	12/2014	Ren et al.
8,636,212 B2	1/2014	Nahill et al.	8,914,290 B2	12/2014	Hendrickson et al.
8,636,215 B2	1/2014	Ding et al.	8,914,788 B2	12/2014	Pettinelli et al.
8,636,224 B2	1/2014	Wang	8,915,439 B2	12/2014	Feng et al.
8,638,806 B2	1/2014	Wang et al.	8,915,444 B2	12/2014	Havens et al.
8,640,958 B2	2/2014	Lu et al.	8,916,789 B2	12/2014	Woodburn
8,640,960 B2	2/2014	Wang et al.	8,918,250 B2	12/2014	Hollifield
8,643,717 B2	2/2014	Li et al.	8,918,564 B2	12/2014	Caballero
8,646,692 B2	2/2014	Meier et al.	8,925,818 B2	1/2015	Kosecki et al.
8,646,694 B2	2/2014	Wang et al.	8,939,374 B2	1/2015	Jovanovski et al.
8,657,200 B2	2/2014	Ren et al.	8,942,480 B2	1/2015	Ellis
8,659,397 B2	2/2014	Vargo et al.	8,944,313 B2	2/2015	Williams et al.
8,668,149 B2	3/2014	Good	8,944,327 B2	2/2015	Meier et al.
8,678,285 B2	3/2014	Kearney	8,944,332 B2	2/2015	Harding et al.
8,678,286 B2	3/2014	Smith et al.	8,950,678 B2	2/2015	Germaine et al.
8,682,077 B1	3/2014	Longacre	D723,560 S	3/2015	Zhou et al.
			8,967,468 B2	3/2015	Gomez et al.
			8,971,346 B2	3/2015	Sevier
			8,976,030 B2	3/2015	Cunningham et al.
			8,976,368 B2	3/2015	Akel et al.

(56)	References Cited	2007/0123350 A1*	5/2007	Soderlund	A61B 5/0476 463/36
	U.S. PATENT DOCUMENTS	2007/0124027 A1	5/2007	Betziza et al.	
		2007/0168461 A1*	7/2007	Moore	G06F 19/328 709/217
8,978,981 B2	3/2015 Guan				
8,978,983 B2	3/2015 Bremer et al.	2008/0228365 A1	9/2008	White et al.	
8,978,984 B2	3/2015 Hennick et al.	2009/0040054 A1	2/2009	Wang et al.	
8,985,456 B2	3/2015 Zhu et al.	2009/0134221 A1	5/2009	Zhu et al.	
8,985,457 B2	3/2015 Soule et al.	2009/0227965 A1	9/2009	Wijesiriwardana	
8,985,459 B2	3/2015 Kearney et al.	2010/0094502 A1	4/2010	Ito	
8,985,461 B2	3/2015 Gelay et al.	2010/0145218 A1	6/2010	Adachi et al.	
8,988,578 B2	3/2015 Showering	2010/0177076 A1	7/2010	Essinger et al.	
8,988,590 B2	3/2015 Gillet et al.	2010/0177080 A1	7/2010	Essinger et al.	
8,991,704 B2	3/2015 Hopper et al.	2010/0177707 A1	7/2010	Essinger et al.	
8,996,194 B2	3/2015 Davis et al.	2010/0177749 A1	7/2010	Essinger et al.	
8,996,384 B2	3/2015 Funyak et al.	2010/0324936 A1*	12/2010	Vishnubhatla	G06F 19/328 705/3
8,998,091 B2	4/2015 Edmonds et al.				
9,002,641 B2	4/2015 Showering	2011/0169999 A1	7/2011	Grunow et al.	
9,007,368 B2	4/2015 Laffargue et al.	2011/0187640 A1	8/2011	Jacobsen et al.	
9,010,641 B2	4/2015 Qu et al.	2011/0202554 A1	8/2011	Powilleit et al.	
9,015,513 B2	4/2015 Murawski et al.	2011/0213511 A1	9/2011	Visconti et al.	
9,016,576 B2	4/2015 Brady et al.	2011/0247027 A1*	10/2011	Davis	H04N 21/25435 725/5
D730,357 S	5/2015 Fitch et al.				
9,022,288 B2	5/2015 Nahill et al.	2012/0046531 A1	2/2012	Hua	
9,030,964 B2	5/2015 Essinger et al.	2012/0108995 A1	5/2012	Pradeep et al.	
9,033,240 B2	5/2015 Smith et al.	2012/0111946 A1	5/2012	Golant	
9,033,242 B2	5/2015 Gillet et al.	2012/0168512 A1	7/2012	Kotlarsky et al.	
9,036,054 B2	5/2015 Koziol et al.	2012/0172744 A1*	7/2012	Kato	A61B 5/0478 600/544
9,037,344 B2	5/2015 Chamberlin				
9,038,911 B2	5/2015 Xian et al.	2012/0193423 A1	8/2012	Samek	
9,038,915 B2	5/2015 Smith	2012/0203647 A1	8/2012	Smith	
D730,901 S	6/2015 Oberpriller et al.	2012/0223141 A1	9/2012	Good et al.	
D730,902 S	6/2015 Fitch et al.	2013/0043312 A1	2/2013	Van Horn	
D733,112 S	6/2015 Chaney et al.	2013/0075168 A1	3/2013	Amundsen et al.	
9,047,098 B2	6/2015 Barten	2013/0130799 A1	5/2013	Van Hulle et al.	
9,047,359 B2	6/2015 Caballero et al.	2013/0175341 A1	7/2013	Kearney et al.	
9,047,420 B2	6/2015 Caballero	2013/0175343 A1	7/2013	Good	
9,047,525 B2	6/2015 Barber	2013/0204153 A1	8/2013	Buzhardt	
9,047,531 B2	6/2015 Showering et al.	2013/0226408 A1	8/2013	Fung et al.	
9,049,640 B2	6/2015 Wang et al.	2013/0239187 A1*	9/2013	Leddy	H04L 9/3226 726/6
9,053,055 B2	6/2015 Caballero				
9,053,378 B1	6/2015 Hou et al.	2013/0257744 A1	10/2013	Daghigh et al.	
9,053,380 B2	6/2015 Xian et al.	2013/0257759 A1	10/2013	Daghigh	
9,057,641 B2	6/2015 Amundsen et al.	2013/0270346 A1	10/2013	Xian et al.	
9,058,526 B2	6/2015 Powilleit	2013/0287258 A1	10/2013	Kearney	
9,064,165 B2	6/2015 Havens et al.	2013/0292475 A1	11/2013	Kotlarsky et al.	
9,064,167 B2	6/2015 Xian et al.	2013/0292477 A1	11/2013	Hennick et al.	
9,064,168 B2	6/2015 Todeschini et al.	2013/0293539 A1	11/2013	Hunt et al.	
9,064,254 B2	6/2015 Todeschini et al.	2013/0293540 A1	11/2013	Laffargue et al.	
9,066,032 B2	6/2015 Wang	2013/0296731 A1	11/2013	Kidmose et al.	
9,070,032 B2	6/2015 Corcoran	2013/0306728 A1	11/2013	Thuries et al.	
D734,339 S	7/2015 Zhou et al.	2013/0306731 A1	11/2013	Pedrarò	
D734,751 S	7/2015 Oberpriller et al.	2013/0307964 A1	11/2013	Bremer et al.	
9,082,023 B2	7/2015 Feng et al.	2013/0308625 A1	11/2013	Park et al.	
9,224,022 B2	12/2015 Ackley et al.	2013/0313324 A1	11/2013	Koziol et al.	
9,224,027 B2	12/2015 Van Horn et al.	2013/0313325 A1	11/2013	Wilz et al.	
D747,321 S	1/2016 London et al.	2013/0342717 A1	12/2013	Havens et al.	
9,230,140 B1	1/2016 Ackley	2014/0001267 A1	1/2014	Giordano et al.	
9,443,123 B2	1/2016 Hejl	2014/0002828 A1	1/2014	Laffargue et al.	
9,250,712 B1	2/2016 Todeschini	2014/0008439 A1	1/2014	Wang	
9,258,033 B2	2/2016 Showering	2014/0025584 A1	1/2014	Liu et al.	
9,262,633 B1	2/2016 Todeschini et al.	2014/0100813 A1	1/2014	Showering	
9,310,609 B2	4/2016 Rueblinger et al.	2014/0034734 A1	2/2014	Sauerwein	
D757,009 S	5/2016 Oberpriller et al.	2014/0036848 A1	2/2014	Pease et al.	
9,342,724 B2	5/2016 McCloskey	2014/0039693 A1	2/2014	Havens et al.	
9,375,945 B1	6/2016 Bowles	2014/0042814 A1	2/2014	Kather et al.	
D760,719 S	7/2016 Zhou et al.	2014/0049120 A1	2/2014	Kohtz et al.	
9,390,596 B1	7/2016 Todeschini	2014/0049635 A1	2/2014	Laffargue et al.	
D762,604 S	8/2016 Fitch et al.	2014/0061306 A1	3/2014	Wu et al.	
D762,647 S	8/2016 Fitch et al.	2014/0063289 A1	3/2014	Hussey et al.	
9,412,242 B2	8/2016 Van Horn et al.	2014/0066136 A1	3/2014	Sauerwein et al.	
D766,244 S	9/2016 Zhou et al.	2014/0067692 A1	3/2014	Ye et al.	
9,443,222 B2	9/2016 Singel et al.	2014/0070005 A1	3/2014	Nahill et al.	
9,478,113 B2	10/2016 Xie et al.	2014/0071840 A1	3/2014	Venancio	
9,507,974 B1	11/2016 Todeschini	2014/0074746 A1	3/2014	Wang	
2006/0258408 A1	11/2006 Tuomela et al.	2014/0076974 A1	3/2014	Havens et al.	
2007/0010756 A1	1/2007 Viertio-Oja	2014/0078341 A1	3/2014	Havens et al.	
2007/0063048 A1	3/2007 Havens et al.	2014/0078342 A1	3/2014	Li et al.	
		2014/0078345 A1	3/2014	Showering	

(56)

References Cited

U.S. PATENT DOCUMENTS

2016/0014251 A1 1/2016 Hejl
 2016/0040982 A1 2/2016 Li et al.
 2016/0042241 A1 2/2016 Todeschini
 2016/0057230 A1 2/2016 Todeschini et al.
 2016/0103487 A1 4/2016 Crawford et al.
 2016/0109219 A1 4/2016 Ackley et al.
 2016/0109220 A1 4/2016 Laffargue
 2016/0109224 A1 4/2016 Thuries et al.
 2016/0112631 A1 4/2016 Ackley et al.
 2016/0112643 A1 4/2016 Laffargue et al.
 2016/0124516 A1 5/2016 Schoon et al.
 2016/0125217 A1 5/2016 Todeschini
 2016/0125342 A1 5/2016 Miller et al.
 2016/0132707 A1 5/2016 Lindbo et al.
 2016/0133253 A1 5/2016 Braho et al.
 2016/0171720 A1 6/2016 Todeschini
 2016/0178479 A1 6/2016 Goldsmith
 2016/0180678 A1 6/2016 Ackley et al.
 2016/0188944 A1 6/2016 Wilz et al.
 2016/0189087 A1 6/2016 Morton et al.
 2016/0125873 A1 7/2016 Braho et al.
 2016/0227912 A1 8/2016 Oberpriller et al.
 2016/0232891 A1 8/2016 Pecorari
 2016/0292477 A1 10/2016 Bidwell
 2016/0294779 A1 10/2016 Yeakley et al.
 2016/0306769 A1 10/2016 Kohtz et al.
 2016/0314276 A1 10/2016 Sewell et al.
 2016/0314294 A1 10/2016 Kubler et al.

FOREIGN PATENT DOCUMENTS

WO 2014019130 A1 2/2014
 WO 2014110495 A1 7/2014

OTHER PUBLICATIONS

Kapoor et al., "Combining brain computer interfaces with vision for object categorization", Computer Vision and Pattern Recognition, IEEE Conference on 2008, accessible online at <http://ieeexplore.ieee.org/document/4587618/>, pp. 1-8 [Cited in GB Search Report].
 Behroozi et al., "EEG phase patterns reflect the representation of semantic categories of objects", B. Med. Biol. Eng. Comput. (2016) 54:205, Sep. 23, 2015, accessible online at <http://rd.springer.com/article/10.1007%2Fs11517-015-1391-7>, pp. 1-28 [Cited in GB Search Report].
 U.S. Appl. No. 13/367,978, filed Feb. 7, 2012, (Feng et al.); now abandoned.
 U.S. Appl. No. 14/277,337 for Multipurpose Optical Reader, filed May 14, 2014 (Jovanovski et al.); 59 pages; now abandoned.
 U.S. Appl. No. 14/446,391 for Multifunction Point of Sale Apparatus With Optical Signature Capture filed Jul. 30, 2014 (Good et al.); 37 pages; now abandoned.

U.S. Appl. No. 29/516,892 for Table Computer filed Feb. 6, 2015 (Bidwell et al.); 13 pages.
 U.S. Appl. No. 29/523,098 for Handle for a Tablet Computer filed Apr. 7, 2015 (Bidwell et al.); 17 pages.
 U.S. Appl. No. 29/528,890 for Mobile Computer Housing filed Jun. 2, 2015 (Fitch et al.); 61 pages.
 U.S. Appl. No. 29/526,918 for Charging Base filed May 14, 2015 (Fitch et al.); 10 pages.
 U.S. Appl. No. 14/715,916 for Evaluating Image Values filed May 19, 2015 (Ackley); 60 pages.
 U.S. Appl. No. 29/525,068 for Tablet Computer With Removable Scanning Device filed Apr. 27, 2015 (Schulte et al.); 19 pages.
 U.S. Appl. No. 29/468,118 for an Electronic Device Case, filed Sep. 26, 2013 (Oberpriller et al.); 44 pages.
 U.S. Appl. No. 29/530,600 for Cyclone filed Jun. 18, 2015 (Vargo et al.); 16 pages.
 U.S. Appl. No. 14/707,123 for Application Independent DEX/UCS Interface filed May 8, 2015 (Pape); 47 pages.
 U.S. Appl. No. 14/283,282 for Terminal Having Illumination and Focus Control filed May 21, 2014 (Liu et al.); 31 pages; now abandoned.
 U.S. Appl. No. 14/705,407 for Method and System to Protect Software-Based Network-Connected Devices From Advanced Persistent Threat filed May 6, 2015 (Hussey et al.); 42 pages.
 U.S. Appl. No. 14/704,050 for Intermediate Linear Positioning filed May 5, 2015 (Charpentier et al.); 60 pages.
 U.S. Appl. No. 14/705,012 for Hands-Free Human Machine Interface Responsive to a Driver of a Vehicle filed May 6, 2015 (Fitch et al.); 44 pages.
 U.S. Appl. No. 14/715,672 for Augmented Reality Enabled Hazard Display filed May 19, 2015 (Venkatesha et al.); 35 pages.
 U.S. Appl. No. 14/735,717 for Indicia-Reading Systems Having an Interface With a User's Nervous System filed Jun. 10, 2015 (Todeschini); 39 pages.
 U.S. Appl. No. 14/702,110 for System and Method for Regulating Barcode Data Injection Into a Running Application on a Smart Device filed May 1, 2015 (Todeschini et al.); 38 pages.
 U.S. Appl. No. 14/747,197 for Optical Pattern Projector filed Jun. 23, 2015 (Thuries et al.); 33 pages.
 U.S. Appl. No. 14/702,979 for Tracking Battery Conditions filed May 4, 2015 (Young et al.); 70 pages.
 U.S. Appl. No. 29/529,441 for Indicia Reading Device filed Jun. 8, 2015 (Zhou et al.); 14 pages.
 U.S. Appl. No. 14/747,490 for Dual-Projector Three-Dimensional Scanner filed Jun. 23, 2015 (Jovanovski et al.); 40 pages.
 U.S. Appl. No. 14/740,320 for Tactile Switch for a Mobile Electronic Device filed Jun. 16, 2015 (Barndringa); 38 pages.
 U.S. Appl. No. 14/740,373 for Calibrating a Volume Dimensioner filed Jun. 16, 2015 (Ackley et al.); 63 pages.
 Wikipedia, "Evoked potential" downloaded from: https://en.wikipedia.org/wiki/Evoked_potential, Sep. 17, 2015, pp. 1-9.
 Combined Search and Examination Report in related GB Application No. 1721791.0, dated Feb. 19, 2018, pp. 1-9 [All references previously cited].

* cited by examiner

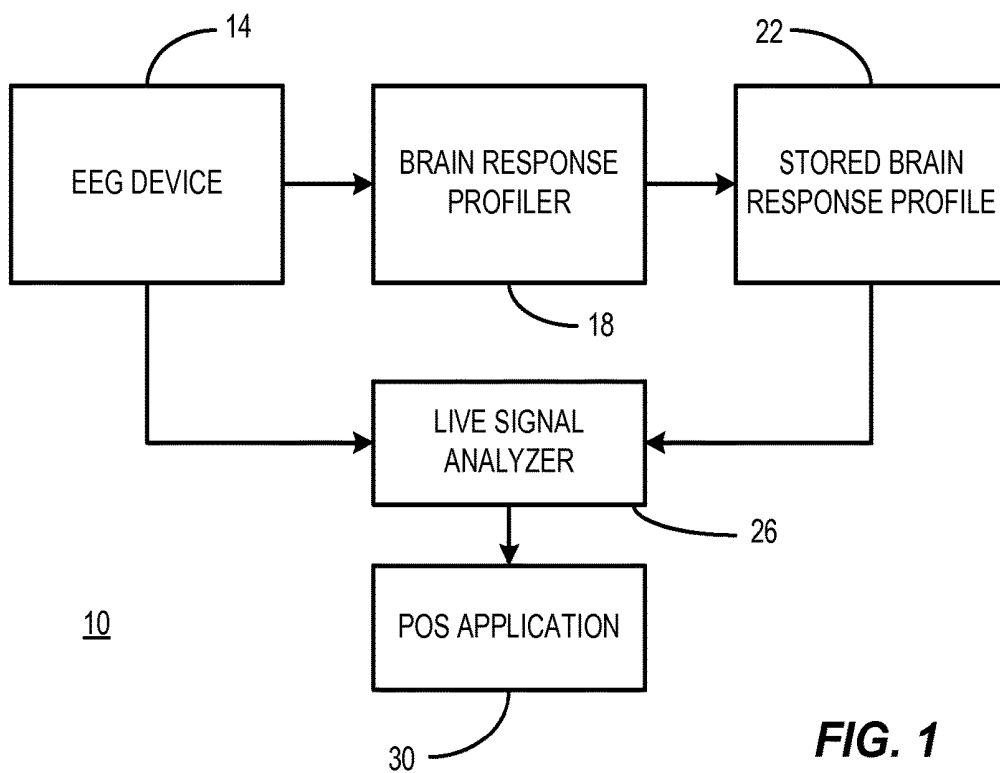


FIG. 1

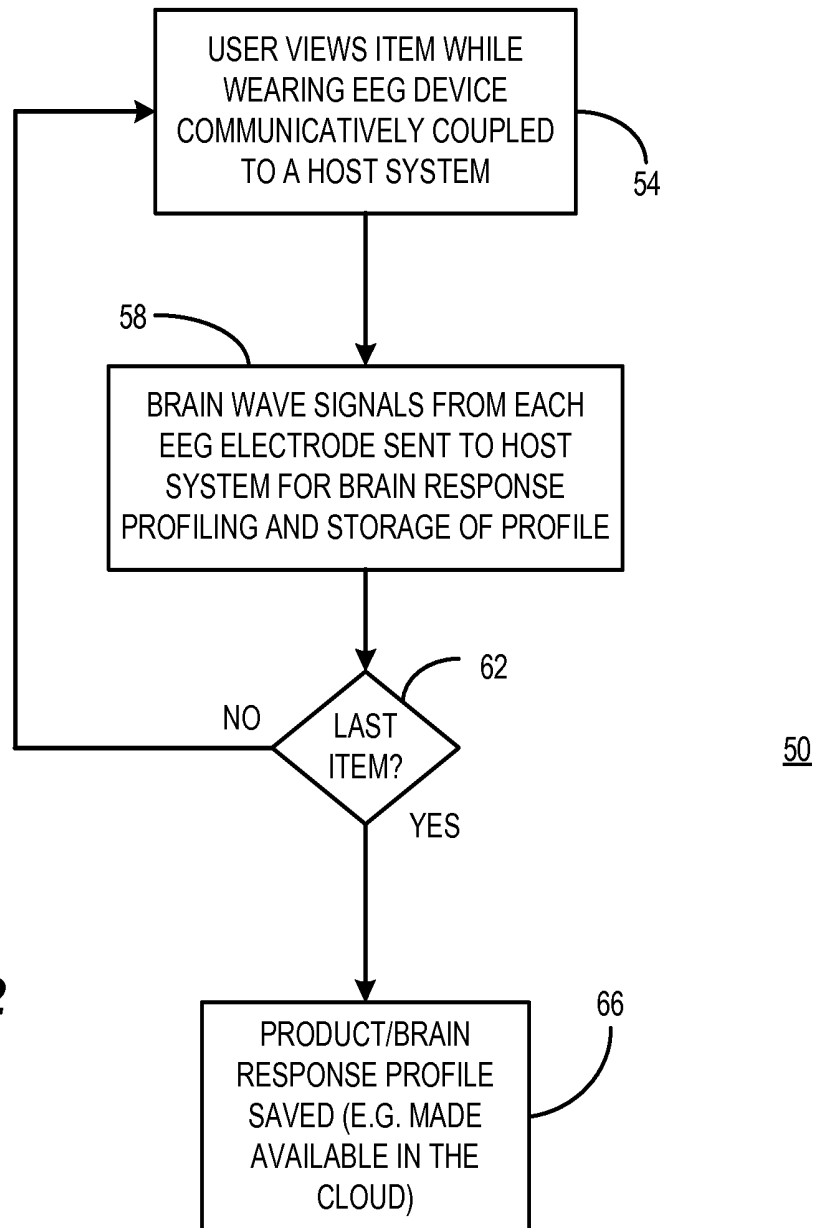
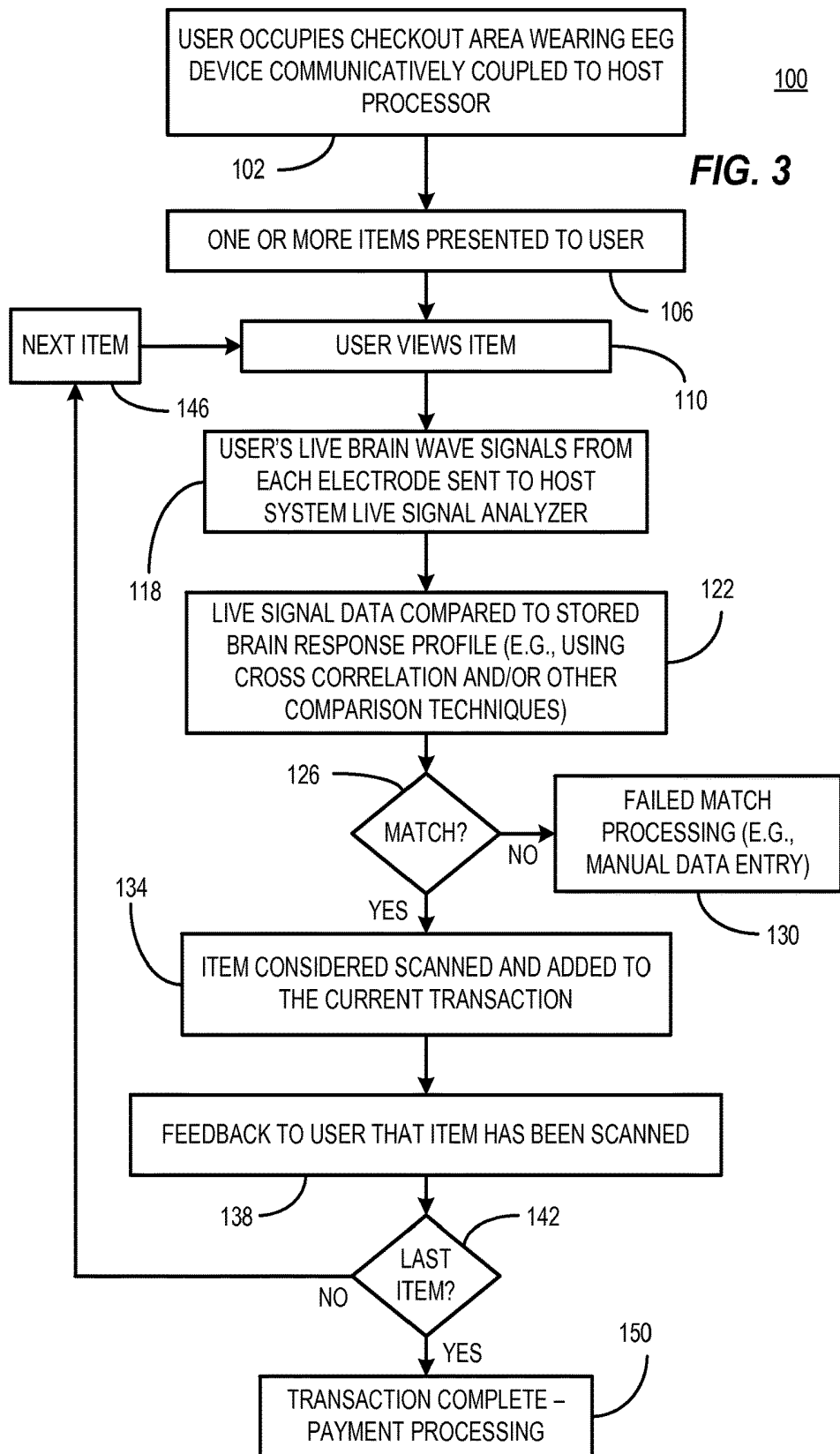
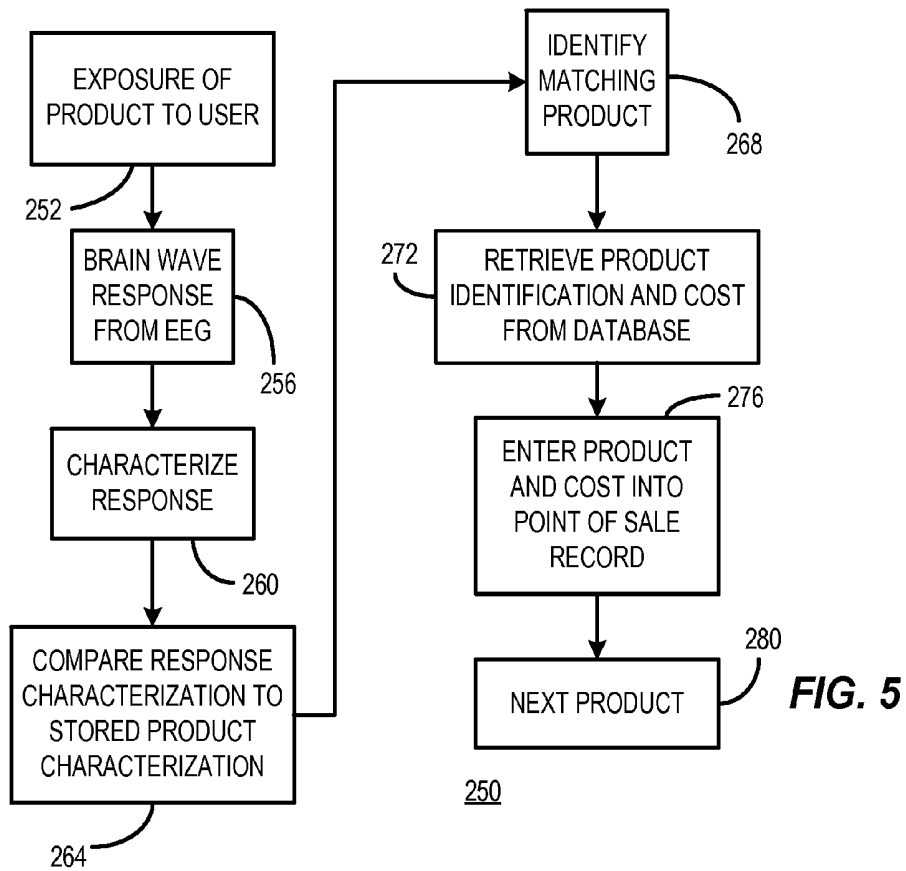
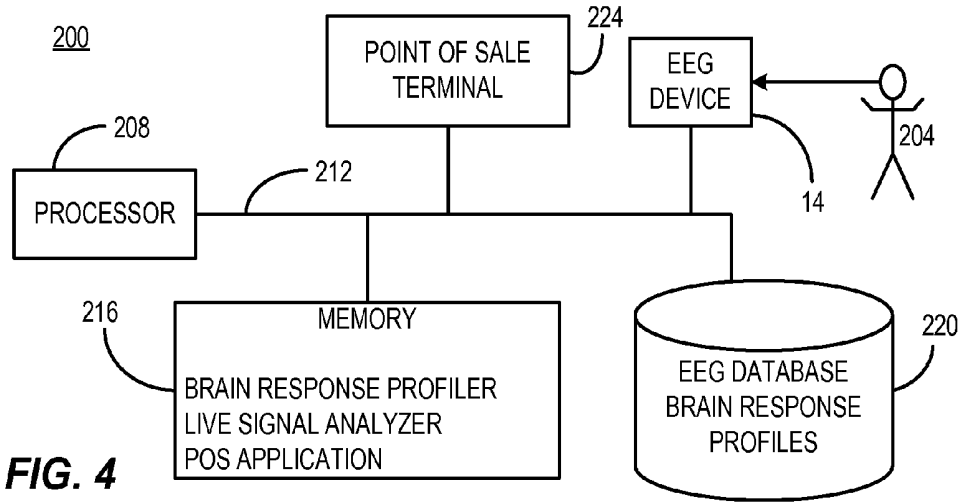


FIG. 2





PRODUCT IDENTIFICATION USING ELECTROENCEPHALOGRAPHY

FIELD OF THE INVENTION

The present invention relates to product identification, as for example in point of sale terminals using Electroencephalography (EEG).

BACKGROUND

Generally speaking, barcode scanning, in particular two dimensional barcode scanning, requires a great deal of image processing, the image to be in perfect focus and adequate lighting conditions. Accurate scanning can be hindered when these conditions are not met or when there is excessive motion. In addition, the barcode should ideally be properly positioned within the field of view of an imager, which may be unintuitive to aim. If any of these preconditions are not met, the barcode often cannot be deciphered. Also, sometimes the barcode itself is printed poorly and can be damaged during the life of the product. This can lead to hard or impossible to read codes. Some items, such as produce, often do not even have barcodes and have to be keyed in manually by a cashier. This can be time consuming and can be impeded by human error. It is also quite simple for a thief to swap the barcode of an expensive item with the barcode of a much cheaper product. These issues can cause major problems and be very expensive for businesses.

Therefore, a need exists for a system that enhances barcode reading or replaces the barcode reading with another system.

SUMMARY

Accordingly, in one aspect, the present invention embraces use of EEG data to aid in identification of items in order to process a Point-Of-Sale transaction.

In an example embodiment, an EEG POS system has an EEG device that detects electrical signals representing brain waves. A database of brain wave profiles represents a plurality of items to be identified. A live signal analyzer compares electrical signals from the EEG device with stored brain wave profiles in the database to identify entries in the database representing items that match the electrical signals from the EEG device, where items whose stored brain wave profiles match the electrical signals are considered identified items. A POS terminal is coupled to the live signal analyzer in order to log and tally items for a transaction.

In another example embodiment, an electroencephalograph (EEG) point of sale system having an EEG device that is configured to detect a plurality of electrical signals representing brain waves. A database of brain wave profiles represent a plurality of items to be identified. A live signal analyzer compares electrical signals from the EEG device with stored brain wave profiles in the database to identify entries in the database representing items that match the electrical signals from the EEG device, where items whose stored brain wave profiles match the electrical signals are considered identified items.

In certain example implementations, the system also has a point of sale terminal coupled to the live signal analyzer that logs and tallies items for a transaction, where the live signal analyzer provides item identification and price data to the point of sale terminal for identified items. In certain example implementations, the live signal analyzer comprises a programmed processor coupled to the EEG device,

the point of sale terminal, and the database. In certain example implementations, the EEG device is configured as headgear that is to be worn by a user. In certain example implementations, a brain response profiler generates a brain response profile for an item from the EEG device and generates a database entry for the item.

In certain example implementations, the brain response profiler is implemented using a programmed processor coupled to the EEG device and the database. In certain example implementations, the live signal analyzer identifies entries in the database representing items that match the electrical signals from the EEG device by cross correlating the plurality of electrical signals from the EEG device with stored database entries representing a plurality of items. In certain example implementations, the electrical signals from the EEG device are converted to frequency domain signals and where the brain response profile is a frequency domain profile.

In yet another example embodiment, 9. A method, involves receiving electroencephalograph (EEG) data generated when a user is exposed to an item that is to be identified; at a programmed processor, comparing the EEG data to a plurality of brain wave profiles stored in a database, the stored brain wave profiles corresponding to identifiable items; ascertaining that a match exists between the EEG data and a stored brain wave profile for a particular identifiable item; retrieving information from the database associated with the particular identifiable item; and passing the information retrieved from the database to a point of sale terminal.

In certain example implementations, the information retrieved from the database comprises item identification and price data. In certain example implementations, the comparing comprises calculating a cross correlation between the EEG data and a plurality of the stored brain wave profiles. In certain example implementations, the method further involves processing the EEG data using a fast Fourier transform. In certain example implementations, the EEG data and the brain wave profiles are represented in the frequency domain.

In another aspect, the present invention involves a training method, including receiving EEG training data from an EEG device that is generated when a user is exposed to a training item; generating an item brain wave profile for the training item that characterizes the EEG training data along with data identifying the training item; and storing the item brain wave profile in a database.

In certain example implementations, the method further involves receiving electroencephalograph (EEG) data generated when a user is exposed to an item that is to be identified; at a programmed processor, comparing the EEG data to a plurality of item brain wave profiles stored in the database; ascertaining that a match exists between the EEG data and a stored item brain wave profile for a particular identifiable item; retrieving information from the database associated with the particular identifiable item; and passing the information retrieved from the database to a point of sale terminal.

In certain example implementations, the information retrieved from the database includes item identification and price data. In certain example implementations, the comparing involves calculating a cross correlation between the EEG data and a plurality of the stored brain wave profiles. In certain example implementations, processing the EEG data involves using a fast Fourier transform. In certain example implementations, the EEG data and the brain wave profiles are represented in the frequency domain.

The foregoing illustrative summary, as well as other exemplary objectives and/or advantages of the invention, and the manner in which the same are accomplished, are further explained within the following detailed description and its accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 depicts a logical block diagram of a system consistent with certain example embodiments consistent with the present invention.

FIG. 2 is an example of a flow chart depicting a training process as used with certain example embodiments consistent with the present invention.

FIG. 3 is an example of a flow chart depicting an operational process as used in certain example embodiments consistent with the present invention.

FIG. 4 is an example system block diagram for an illustrative system consistent with the present teachings.

FIG. 5 is an example of a flow chart of an overall process including training and operation of an example system consistent with the present invention.

DETAILED DESCRIPTION

The present invention embraces methods and apparatus using electroencephalograph data to scan items to be checked out at a point of sale terminal, for example, at a retail establishment.

As previously noted barcode scanning, in particular two dimensional barcode scanning, requires a great deal of image processing, minimal motion, perfect focus, proper placement in a scanner's field, clear bar code printing and adequate lighting conditions. Accurate scanning can be hindered when these conditions are not met. If any of these preconditions are not met, the barcode often cannot be deciphered.

As the form factor of our products continue to evolve, so too will the way in which we interact with them. Today there are several ways of interfacing with smart devices other than traditional hardware buttons. Touch screen gesturing, voice recognition, inertial sensors motion detection, 3D sensor gesture recognition and other methods have become commonplace for interfacing with a computer. More recently, many advances have been made in improvements in the brain-computer interface (BCI). All BCI devices on the market today use electroencephalography (EEG) as their core technology. This involves the placement of an array of electrodes on the head, which measure voltage fluctuations resulting from ionic current flows within the neurons of the brain. These electromagnetic signals are recorded, processed and the source of the activity is isolated.

Embodiments consistent with the present invention can address the above problems by removing most of the preconditions necessary to successfully identify a product. It removes the need for any image processing, any mechanical autofocus routine, can operate in extremely low light conditions, and is motion tolerant. It also removes the need for a barcode altogether, thus eliminating all the issues regarding print quality, code damage, and theft. It also facilitates the identification of items like produce, which typically do not contain barcodes. This is done by replacing or supplementing the current method of product identification using a barcode scanner with the human brain in cooperation with EEG technology.

Recent advances in Electroencephalography (EEG) have taken the ability to read electronic signals produced by the

brain out of the lab and into to more mainstream applications. Relatively inexpensive EEG devices have been brought to market that do not require shaving of the subject's head or gels of any kind. Such devices can be easily worn by the user and are quite unobtrusive and even stylish.

In accord with the present discussion, an EEG device is used to identify a product that is being viewed without the use of barcode technology and unreliable image processing (or as a supplement thereto). Certain embodiments utilize the extremely efficient object recognition algorithms ingrained within the human brain to determine what object is currently being looked at. Such embodiments also capitalize on the focusing and light sensitivity powers of the human eye to make sure the object is always in focus and perfectly exposed. Real-time readings from the EEG may be compared to known readings that have been previously cataloged for the current user. In other words, certain embodiments of this invention aim to heavily leverage what hundreds of thousands of years of evolution have given humans.

In accord with certain embodiments, an Electroencephalography (EEG) device, e.g. such as devices similar to the Emotiv EPOC product (Commercially available from Emotiv, Inc., 490 Post St. Suite 824, San Francisco, Calif. 94102 USA) is used to characterize brain waves for purposes of identifying products at checkout. In one example, a training process is conducted in which a retail store clerk is shown all or a portion of the products available for sale in a store while wearing the EEG device. The employee's brain response to the sight of each object can be recorded and cataloged for that particular employee. After training is complete there will exist a catalog of unique brain responses (for each employee) paired with an identifier for each product within the system.

In the example of a grocery store, when products are placed on a checkout conveyor belt, the store clerk wearing the EEG device simply needs to look at each item individually while bagging them. The EEG device produces an EEG representation of the clerk's brain responses. This EEG representation is then compared to the pre-cataloged list of responses acquired during employee training to identify the products that are currently being looked at. When matches are obtained between the current EEG signal and the pre-cataloged list of responses are found, visual and/or audible feedback can be produced for the clerk in order to confirm to the clerk that the product has been identified. The system can record the associated item and its price for checkout.

This technology can be used standalone or combined with existing bar code reader technology, or can be paired with eye direction detection, so that one barcode in a field can be selected and trigger the scan of the desired code.

An exemplary embodiment is depicted from a logical block diagram perspective as system 10 of FIG. 1 in which an EEG device 14 produces signals that represent brain waves of a user when viewing an object. While training this device to the brain wave signals of a particular user, a brain response profiler 18 receives signals from each of a plurality (e.g., sixteen) of electrodes affixed to the user's scalp. This placement of the electrodes can be accomplished using headgear equipped with EEG electrodes as the EEG device 14.

The brain wave signals represented by voltages picked up at each of the electrodes is processed by the brain response profiler to generate a profile for the user's brain waves when the user is presented with a visual (and possibly tactile) exposure to an item that is to be profiled. Such a profile is generated for each of a plurality of items representing

inventory in a retail establishment. The profile of the brain waves is associated with an identifier of the item and a price to be charged for that item to complete a profile record for each of the items to be processed. The profile can then be stored to a database to produce stored brain response profiles **22**.

When the brain response profiles **22** are completed for each item, the training process is complete. The brain wave signals during normal operation of a user (e.g., a retail clerk) from EEG device **14** are then passed to a live signal analyzer **26**. The live signal analyzer **26** receives the EEG signals as the user views items that are to be checked out one at a time. The live signal analyzer **26** generates a profile in a manner similar to the brain response profiler **18** and conducts a comparison of the live brain response profile with the stored brain response profiles stored at **22** in order to identify a close match. This can be accomplished using any number of techniques including cross-correlation of the profiles to seek the highest correlation. When a match is achieved, the item is identified by the live signal analyzer and the identity of the item and price is transferred to a point of sale (POS) application for tallying and logging for use in completing the retail transaction.

Referring now to FIG. 2, a training process is described in connection with example block diagram **50** starting at **54** where the user being trained views items while wearing an EEG device that is communicatively coupled to a host computer system. As an item is being viewed, the brain wave signals associated with the item is sent from each of the EEG electrodes to the host system for brain response profiling and storage of the brain response profile at **58**. If the last item to be trained has not been reached at **62**, the user then proceeds to the next item at **54** and the process is repeated. When the last item has been reached at **62**, the profile of each product and the brain response profile associated therewith can be stored (e.g., to cloud storage) for later retrieval during the operational process.

Referring now to FIG. 3, an operational process for use of the EEG technology for item identification in a retail environment by a user such as a store clerk is depicted in example flow chart **100** starting at **102**. At **102**, a user occupies the checkout area wearing an EEG device that is wired or wirelessly coupled to a host processor. A transaction is initiated and the user is presented with one or more items for checkout in a normal manner at **106**. One by one, the user views each item at **110** to produce a brain wave response that is represented by the signals from each of the electrodes of the EEG device and sent to a host system's live signal analyzer at **118**.

The host system's live signal analyzer compares the live EEG signals with stored brain response profiles for the user at **122** in order to identify a matching item in the brain response/product profiles. If no match is achieved at **126**, a failure routine is entered at **130** to allow for other data entry techniques. Moreover, excessive failures to identify an item may be indicative of an improperly installed EEG device or a need for further training to better characterize the items that are to be identified.

When a match is achieved at **126**, the item is considered "scanned" and identified at **134** and it can be logged to the current transaction along with an identifier of the item and a price to be charged. Feedback can be generated at **138** upon completion of a scan to let the user know that the item has been successfully scanned and the next item (if any) can be viewed. If the item is not the last item at **142**, the next item is retrieved at **146** and control passes to **110** to repeat the process. When the last item is reached at **142**, the

transaction can enter a final stage in which payment is processed at **150** and the transaction can be deemed completed.

Turning now to FIG. 4, an example system **200** is depicted. A user **204** is connected to an EEG device **14** that is suitably interfaced to a host processor **208** either with a wired connection such as a universal serial bus (USB) connection or via a wireless connection. The connection of EEG device **14** is represented functionally in this illustration as a connection to bus **212** of the system **200**.

The host processor **208** may be locally or remotely situated or cloud based without limitation. Moreover, processor **208** can be made up of one processor or a plurality of processors. The processor **208** is coupled to memory **216** that includes routines or modules that correspond to the functions of brain response profiler, live signal analyzer, and Point-Of-Sale applications. Processor is further communicatively coupled to EEG database **220** that contains entries corresponding to brain wave profiles and other data for a plurality of identifiable items. Processor **208** is further communicatively coupled to a Point-Of-Sale terminal **224** that is used to carry out a financial transaction with a customer.

During the training process discussed above, the EEG device **14** measures brain wave signals from the user as the user views and/or is otherwise exposed to an item that could be purchased. The brain response profiler operation is carried out by processor **208** to create a profile of each item and the profile is then stored in the database **220**.

During live operation, the user **204** is exposed to items that are being purchased and the associated live EEG data is produced by EEG device **14**. This live EEG data is analyzed by the processor **208** using the live signal analyzer process to conduct a comparison between the live EEG data and the EEG database entries to identify the item. Once the item is identified, information such as an item name or description can be retrieved from the database along with price for the item. This information is then transferred to the POS application for use at the POS terminal to complete a transaction by adding the item to a list of items being purchased and adding the price to a transaction tally.

An example of the operation of system while carrying out a live transaction is depicted in one example by the flow chart **250** of FIG. 5 start starting at **252** where the user is exposed to a product to be identified. Electroencephalograph (EEG) data is generated when the user is exposed to an item that is to be identified at **256**. The raw data from the EEG can be used or the EEG data can be converted to a characterization of the EEG response at **260**. The processor then compares the EEG data to a plurality of brain wave profiles stored in a database at **264**, where the stored brain wave profiles corresponding to identifiable items in the database. At **268**, the process ascertains that a match exists between the EEG data and a stored brain wave profile for a particular identifiable item. Information is retrieved from the database entry associated with the particular identifiable item at **272** (e.g., an identification of the item and a cost). The retrieved information can then be transferred at **276** from the database to the point of sale terminal so that the price and item identifier can be entered into the POS transaction record. The system is then ready to process the next product at **280**.

EEG technology is used to measure brain activity which is generally classified by frequency bands: Delta (δ , below 4 Hz), Theta (θ , 4-7 Hz), Alpha (α , 8-12 Hz), Beta (β , 13-30 Hz) and Gamma (γ , above 30 Hz). The output of an EEG device is a collection of signals picked up by sensors placed about a user's head, which picks up brain activity, in the

form of measured voltage fluctuations resulting from ionic current within the neurons of the brain, in the above frequency bands. These signals can represent intensity and frequency of brain waves as received by each of the sensors. In accord with the present teachings, a collection of such signals received by a plurality of sensors can be used as a “signature” that identifies a user’s brain activity when visually stimulated by viewing a particular object.

An evoked potential is the electrical response of the brain to a stimulus. In the present case, the EEG device measures electrical potentials at the electrodes that are evoked in response to visual stimulation of the brain when the user is exposed to an item that is to be identified. In general, N sensors (e.g., N=16) in an EEG device will produce N output signals which may, in certain implementations, be represented as a sequence of K samples of the electrical potential present at each of the electrodes. So, for N electrodes, one form of EEG output can be represented as a matrix as shown:

Sample 1	V1(1)	V2(1)	V3(1)	V4(1) . . . VN(1)
Sample 2	V1(2)	V2(2)	V3(2)	V4(2) . . . VN(2)
...				
Sample K	V1(K)	V2(K)	V3(K)	V4(K) . . . VN(K)

In one embodiment consistent with the present teachings, this matrix of sample values (or a normalized version thereof) can be used directly as a brain wave profile for storage in the database along with other information such as the following simple record for an example item:

Item Name	Price	Per	Profile
Watermelon	\$6.95	Each	[watermelon profile matrix]

It will be appreciated that when items are sold by weight, after recognizing the item, the actual cost that is tallied for checkout will factor in the weight of the product. It is further noted that the above example profile is somewhat minimalist since the database can also store other data such as inventory related data, manufacturer or supplier, rebate information and other data.

During operation, the live EEG data as read by the EEG device can be arranged in a matrix in the same manner as that used in the profile and then compared to the profile matrices stored in the database using any suitable comparison technique to identify an item in the database that can be considered a match for the item represented by the Live EEG data.

Many variations are possible. For example, the profile data for a particular item (as well as the live EEG data representation) can be processed to either simplify calculations or enhance accuracy. In one example, data averaging techniques can be used. In other examples, the time domain sample data can be processed by a fast Fourier transform (FFT) to convert the data to a sequence of samples representing the brain waves in the frequency domain. In yet other examples, the frequency domain data can be added together and possibly normalized in order to construct a composite set of data for the set of N electrodes. This may reduce the volume of data and allow for classification of the data to facilitate enhancement of speed of carrying out the comparison operations.

Those skilled in the art will appreciate that other techniques for manipulation and interpretation of EEG signals

can be utilized including those which involve averaging the EEG activity time-locked to the presentation of a stimulus and other techniques known in the field of signal processing and EEG interpretation for cognitive science, cognitive psychology, and psychophysiology. Algorithms to determine what is considered a match and what type of tolerance is acceptable can be determined experimentally.

* * *

To supplement the present disclosure, this application incorporates entirely by reference the following commonly assigned patents, patent application publications, and patent applications:

- U.S. Pat. Nos. 6,832,725; 7,128,266; 7,159,783; 7,413,127; 7,726,575; 8,294,969; 8,317,105; 8,322,622; 8,366,005; 8,371,507; 8,376,233; 8,381,979; 8,390,909; 8,408,464; 8,408,468; 8,408,469; 8,424,768; 8,448,863; 8,457,013; 8,459,557; 8,469,272; 8,474,712; 8,479,992; 8,490,877; 8,517,271; 8,523,076; 8,528,818; 8,544,737; 8,548,242; 8,548,420; 8,550,335; 8,550,354; 8,550,357; 8,556,174; 8,556,176; 8,556,177; 8,559,767; 8,599,957; 8,561,895; 8,561,903; 8,561,905; 8,565,107; 8,571,307; 8,579,200; 8,583,924; 8,584,945; 8,587,595; 8,587,697; 8,588,869; 8,590,789; 8,596,539; 8,596,542; 8,596,543; 8,599,271; 8,599,957; 8,600,158; 8,600,167; 8,602,309; 8,608,053; 8,608,071; 8,611,309; 8,615,487; 8,616,454; 8,621,123; 8,622,303; 8,628,013; 8,628,015; 8,628,016; 8,629,926; 8,630,491; 8,635,309; 8,636,200; 8,636,212; 8,636,215; 8,636,224; 8,638,806; 8,640,958; 8,640,960; 8,643,717; 8,646,692; 8,646,694; 8,657,200; 8,659,397; 8,668,149; 8,678,285; 8,678,286; 8,682,077; 8,687,282; 8,692,927; 8,695,880; 8,698,949; 8,717,494; 8,717,494; 8,720,783; 8,723,804; 8,723,904; 8,727,223; D702,237; 8,740,082; 8,740,085; 8,746,563; 8,750,445; 8,752,766; 8,756,059; 8,757,495; 8,760,563; 8,763,909; 8,777,108; 8,777,109; 8,779,898; 8,781,520; 8,783,573; 8,789,757; 8,789,758; 8,789,759; 8,794,520; 8,794,522; 8,794,525; 8,794,526; 8,798,367; 8,807,431; 8,807,432; 8,820,630; 8,822,848; 8,824,692; 8,824,696; 8,842,849; 8,844,822; 8,844,823; 8,849,019; 8,851,383; 8,854,633; 8,866,963; 8,868,421; 8,868,519; 8,868,802; 8,868,803; 8,870,074; 8,879,639; 8,880,426; 8,881,983; 8,881,987; 8,903,172; 8,908,995; 8,910,870; 8,910,875; 8,914,290; 8,914,788; 8,915,439; 8,915,444; 8,916,789; 8,918,250; 8,918,564; 8,925,818; 8,939,374; 8,942,480; 8,944,313; 8,944,327; 8,944,332; 8,950,678; 8,967,468; 8,971,346; 8,976,030; 8,976,368; 8,978,981; 8,978,983; 8,978,984; 8,985,456; 8,985,457; 8,985,459; 8,985,461; 8,988,578; 8,988,590; 8,991,704; 8,996,194; 8,996,384; 9,002,641; 9,007,368; 9,010,641; 9,015,513; 9,016,576; 9,022,288; 9,030,964; 9,033,240; 9,033,242; 9,036,054; 9,037,344; 9,038,911; 9,038,915; 9,047,098; 9,047,359; 9,047,420; 9,047,525; 9,047,531; 9,053,055; 9,053,378; 9,053,380; 9,058,526; 9,064,165; 9,064,167; 9,064,168; 9,064,254; 9,066,032; 9,070,032;
- U.S. Design Pat. Nos. D716,285; D723,560; D730,357; D730,901; D730,902; D733,112; D734,339;
- International Publication No. 2013/163789; International Publication No. 2013/173985; International Publication No. 2014/019130; International Publication No. 2014/110495;
- U.S. Patent Application Publication No. 2008/0185432; U.S. Patent Application Publication No. 2009/0134221; U.S. Patent Application Publication No. 2010/0177080; U.S. Patent Application Publication No. 2010/0177076; U.S. Patent Application Publication No. 2010/0177707; U.S. Patent Application Publication No. 2010/0177749; U.S.

Patent Application Publication No. 2015/0028104; U.S. Patent Application Publication No. 2015/0029002; U.S. Patent Application Publication No. 2015/0032709; U.S. Patent Application Publication No. 2015/0039309; U.S. Patent Application Publication No. 2015/0039878; U.S. Patent Application Publication No. 2015/0040378; U.S. Patent Application Publication No. 2015/0048168; U.S. Patent Application Publication No. 2015/0049347; U.S. Patent Application Publication No. 2015/0051992; U.S. Patent Application Publication No. 2015/0053766; U.S. Patent Application Publication No. 2015/0053768; U.S. Patent Application Publication No. 2015/0053769; U.S. Patent Application Publication No. 2015/0060544; U.S. Patent Application Publication No. 2015/0062366; U.S. Patent Application Publication No. 2015/0063215; U.S. Patent Application Publication No. 2015/0063676; U.S. Patent Application Publication No. 2015/0069130; U.S. Patent Application Publication No. 2015/0071819; U.S. Patent Application Publication No. 2015/0083800; U.S. Patent Application Publication No. 2015/0086114; U.S. Patent Application Publication No. 2015/0088522; U.S. Patent Application Publication No. 2015/0096872; U.S. Patent Application Publication No. 2015/0099557; U.S. Patent Application Publication No. 2015/0100196; U.S. Patent Application Publication No. 2015/0102109; U.S. Patent Application Publication No. 2015/0115035; U.S. Patent Application Publication No. 2015/0127791; U.S. Patent Application Publication No. 2015/0128116; U.S. Patent Application Publication No. 2015/0129659; U.S. Patent Application Publication No. 2015/0133047; U.S. Patent Application Publication No. 2015/0134470; U.S. Patent Application Publication No. 2015/0136851; U.S. Patent Application Publication No. 2015/0136854; U.S. Patent Application Publication No. 2015/0142492; U.S. Patent Application Publication No. 2015/0144692; U.S. Patent Application Publication No. 2015/0144698; U.S. Patent Application Publication No. 2015/0144701; U.S. Patent Application Publication No. 2015/0149946; U.S. Patent Application Publication No. 2015/0161429; U.S. Patent Application Publication No. 2015/0169925; U.S. Patent Application Publication No. 2015/0169929; U.S. Patent Application Publication No. 2015/0178523; U.S. Patent Application Publication No. 2015/0178534; U.S. Patent Application Publication No. 2015/0178535; U.S. Patent Application Publication No. 2015/0178536; U.S. Patent Application Publication No. 2015/0178537; U.S. Patent Application Publication No. 2015/0181093; U.S. Patent Application Publication No. 2015/0181109;

U.S. patent application Ser. No. 13/367,978 for a Laser Scanning Module Employing an Elastomeric U-Hinge Based Laser Scanning Assembly, filed Feb. 7, 2012 (Feng et al.);

U.S. patent application Ser. No. 29/458,405 for an Electronic Device, filed Jun. 19, 2013 (Fitch et al.);

U.S. patent application Ser. No. 29/459,620 for an Electronic Device Enclosure, filed Jul. 2, 2013 (London et al.);

U.S. patent application Ser. No. 29/468,118 for an Electronic Device Case, filed Sep. 26, 2013 (Oberpriller et al.);

U.S. patent application Ser. No. 14/150,393 for Indicia-reader Having Unitary Construction Scanner, filed Jan. 8, 2014 (Colavito et al.);

U.S. patent application Ser. No. 14/200,405 for Indicia Reader for Size-Limited Applications filed Mar. 7, 2014 (Feng et al.);

U.S. patent application Ser. No. 14/231,898 for Hand-Mounted Indicia-Reading Device with Finger Motion Triggering filed Apr. 1, 2014 (Van Horn et al.);

U.S. patent application Ser. No. 29/486,759 for an Imaging Terminal, filed Apr. 2, 2014 (Oberpriller et al.);

U.S. patent application Ser. No. 14/257,364 for Docking System and Method Using Near Field Communication filed Apr. 21, 2014 (Showering);

U.S. patent application Ser. No. 14/264,173 for Autofocus Lens System for Indicia Readers filed Apr. 29, 2014 (Ackley et al.);

U.S. patent application Ser. No. 14/277,337 for MULTIPURPOSE OPTICAL READER, filed May 14, 2014 (Jovanovski et al.);

U.S. patent application Ser. No. 14/283,282 for TERMINAL HAVING ILLUMINATION AND FOCUS CONTROL filed May 21, 2014 (Liu et al.);

U.S. patent application Ser. No. 14/327,827 for a MOBILE-PHONE ADAPTER FOR ELECTRONIC TRANSACTIONS, filed Jul. 10, 2014 (Hejl);

U.S. patent application Ser. No. 14/334,934 for a SYSTEM AND METHOD FOR INDICIA VERIFICATION, filed Jul. 18, 2014 (Hejl);

U.S. patent application Ser. No. 14/339,708 for LASER SCANNING CODE SYMBOL READING SYSTEM, filed Jul. 24, 2014 (Xian et al.);

U.S. patent application Ser. No. 14/340,627 for an AXIALLY REINFORCED FLEXIBLE SCAN ELEMENT, filed Jul. 25, 2014 (Rueblinger et al.);

U.S. patent application Ser. No. 14/446,391 for MULTIFUNCTION POINT OF SALE APPARATUS WITH OPTICAL SIGNATURE CAPTURE filed Jul. 30, 2014 (Good et al.);

U.S. patent application Ser. No. 14/452,697 for INTERACTIVE INDICIA READER, filed Aug. 6, 2014 (Todeschini);

U.S. patent application Ser. No. 14/453,019 for DIMENSIONING SYSTEM WITH GUIDED ALIGNMENT, filed Aug. 6, 2014 (Li et al.);

U.S. patent application Ser. No. 14/462,801 for MOBILE COMPUTING DEVICE WITH DATA COGNITION SOFTWARE, filed on Aug. 19, 2014 (Todeschini et al.);

U.S. patent application Ser. No. 14/483,056 for VARIABLE DEPTH OF FIELD BARCODE SCANNER filed Sep. 10, 2014 (McCloskey et al.);

U.S. patent application Ser. No. 14/513,808 for IDENTIFYING INVENTORY ITEMS IN A STORAGE FACILITY filed Oct. 14, 2014 (Singel et al.);

U.S. patent application Ser. No. 14/519,195 for HANDHELD DIMENSIONING SYSTEM WITH FEEDBACK filed Oct. 21, 2014 (Laffargue et al.);

U.S. patent application Ser. No. 14/519,179 for DIMENSIONING SYSTEM WITH MULTIPATH INTERFERENCE MITIGATION filed Oct. 21, 2014 (Thurries et al.);

U.S. patent application Ser. No. 14/519,211 for SYSTEM AND METHOD FOR DIMENSIONING filed Oct. 21, 2014 (Ackley et al.);

U.S. patent application Ser. No. 14/519,233 for HANDHELD DIMENSIONER WITH DATA-QUALITY INDICATION filed Oct. 21, 2014 (Laffargue et al.);

U.S. patent application Ser. No. 14/519,249 for HANDHELD DIMENSIONING SYSTEM WITH MEASUREMENT-CONFORMANCE FEEDBACK filed Oct. 21, 2014 (Ackley et al.);

U.S. patent application Ser. No. 14/527,191 for METHOD AND SYSTEM FOR RECOGNIZING SPEECH USING WILDCARDS IN AN EXPECTED RESPONSE filed Oct. 29, 2014 (Braho et al.);

U.S. patent application Ser. No. 14/529,563 for ADAPT-
 ABLE INTERFACE FOR A MOBILE COMPUTING
 DEVICE filed Oct. 31, 2014 (Schoon et al.);
 U.S. patent application Ser. No. 14/529,857 for BARCODE
 READER WITH SECURITY FEATURES filed Oct. 31, 5
 2014 (Todeschini et al.);
 U.S. patent application Ser. No. 14/398,542 for PORTABLE
 ELECTRONIC DEVICES HAVING A SEPARATE
 LOCATION TRIGGER UNIT FOR USE IN CONTROL-
 LING AN APPLICATION UNIT filed Nov. 3, 2014 (Bian
 et al.); 10
 U.S. patent application Ser. No. 14/531,154 for DIRECT-
 ING AN INSPECTOR THROUGH AN INSPECTION
 filed Nov. 3, 2014 (Miller et al.);
 U.S. patent application Ser. No. 14/533,319 for BARCODE 15
 SCANNING SYSTEM USING WEARABLE DEVICE
 WITH EMBEDDED CAMERA filed Nov. 5, 2014 (Tode-
 schini);
 U.S. patent application Ser. No. 14/535,764 for CONCAT-
 ENATED EXPECTED RESPONSES FOR SPEECH 20
 RECOGNITION filed Nov. 7, 2014 (Braho et al.);
 U.S. patent application Ser. No. 14/568,305 for AUTO-
 CONTRAST VIEWFINDER FOR AN INDICIA
 READER filed Dec. 12, 2014 (Todeschini);
 U.S. patent application Ser. No. 14/573,022 for DYNAMIC 25
 DIAGNOSTIC INDICATOR GENERATION filed Dec.
 17, 2014 (Goldsmith);
 U.S. patent application Ser. No. 14/578,627 for SAFETY
 SYSTEM AND METHOD filed Dec. 22, 2014 (Ackley et
 al.); 30
 U.S. patent application Ser. No. 14/580,262 for MEDIA
 GATE FOR THERMAL TRANSFER PRINTERS filed
 Dec. 23, 2014 (Bowles);
 U.S. patent application Ser. No. 14/590,024 for SHELVING
 AND PACKAGE LOCATING SYSTEMS FOR DELIV- 35
 ERY VEHICLES filed Jan. 6, 2015 (Payne);
 U.S. patent application Ser. No. 14/596,757 for SYSTEM
 AND METHOD FOR DETECTING BARCODE PRINT-
 ING ERRORS filed Jan. 14, 2015 (Ackley);
 U.S. patent application Ser. No. 14/416,147 for OPTICAL 40
 READING APPARATUS HAVING VARIABLE SET-
 TINGS filed Jan. 21, 2015 (Chen et al.);
 U.S. patent application Ser. No. 14/614,706 for DEVICE
 FOR SUPPORTING AN ELECTRONIC TOOL ON A
 USER'S HAND filed Feb. 5, 2015 (Oberpriller et al.); 45
 U.S. patent application Ser. No. 14/614,796 for CARGO
 APPORTIONMENT TECHNIQUES filed Feb. 5, 2015
 (Morton et al.);
 U.S. patent application Ser. No. 29/516,892 for TABLE
 COMPUTER filed Feb. 6, 2015 (Bidwell et al.); 50
 U.S. patent application Ser. No. 14/619,093 for METHODS
 FOR TRAINING A SPEECH RECOGNITION SYSTEM
 filed Feb. 11, 2015 (Pecorari);
 U.S. patent application Ser. No. 14/628,708 for DEVICE,
 SYSTEM, AND METHOD FOR DETERMINING THE 55
 STATUS OF CHECKOUT LANES filed Feb. 23, 2015
 (Todeschini);
 U.S. patent application Ser. No. 14/630,841 for TERMINAL
 INCLUDING IMAGING ASSEMBLY filed Feb. 25,
 2015 (Gomez et al.);
 U.S. patent application Ser. No. 14/635,346 for SYSTEM
 AND METHOD FOR RELIABLE STORE-AND-FOR-
 FORWARD DATA HANDLING BY ENCODED INFORMA-
 TION READING TERMINALS filed Mar. 2, 2015
 (Sevier);
 U.S. patent application Ser. No. 29/519,017 for SCANNER
 filed Mar. 2, 2015 (Zhou et al.);

U.S. patent application Ser. No. 14/405,278 for DESIGN
 PATTERN FOR SECURE STORE filed Mar. 9, 2015
 (Zhu et al.);
 U.S. patent application Ser. No. 14/660,970 for DECOD-
 ABLE INDICIA READING TERMINAL WITH COM-
 BINED ILLUMINATION filed Mar. 18, 2015 (Kearney et
 al.);
 U.S. patent application Ser. No. 14/661,013 for REPRO-
 GRAMMING SYSTEM AND METHOD FOR
 DEVICES INCLUDING PROGRAMMING SYMBOL
 filed Mar. 18, 2015 (Soule et al.);
 U.S. patent application Ser. No. 14/662,922 for MULTI-
 FUNCTION POINT OF SALE SYSTEM filed Mar. 19,
 2015 (Van Horn et al.);
 U.S. patent application Ser. No. 14/663,638 for VEHICLE
 MOUNT COMPUTER WITH CONFIGURABLE IGNI-
 TION SWITCH BEHAVIOR filed Mar. 20, 2015 (Davis
 et al.);
 U.S. patent application Ser. No. 14/664,063 for METHOD
 AND APPLICATION FOR SCANNING A BARCODE
 WITH A SMART DEVICE WHILE CONTINUOUSLY
 RUNNING AND DISPLAYING AN APPLICATION ON
 THE SMART DEVICE DISPLAY filed Mar. 20, 2015
 (Todeschini);
 U.S. patent application Ser. No. 14/669,280 for TRANS-
 FORMING COMPONENTS OF A WEB PAGE TO
 VOICE PROMPTS filed Mar. 26, 2015 (Funyai et al.);
 U.S. patent application Ser. No. 14/674,329 for AIMER
 FOR BARCODE SCANNING filed Mar. 31, 2015
 (Bidwell);
 U.S. patent application Ser. No. 14/676,109 for INDICIA
 READER filed Apr. 1, 2015 (Huck);
 U.S. patent application Ser. No. 14/676,327 for DEVICE
 MANAGEMENT PROXY FOR SECURE DEVICES
 filed Apr. 1, 2015 (Yeakley et al.);
 U.S. patent application Ser. No. 14/676,898 for NAVIGA-
 TION SYSTEM CONFIGURED TO INTEGRATE
 MOTION SENSING DEVICE INPUTS filed Apr. 2,
 2015 (Showering);
 U.S. patent application Ser. No. 14/679,275 for DIMEN-
 SIONING SYSTEM CALIBRATION SYSTEMS AND
 METHODS filed Apr. 6, 2015 (Laffargue et al.);
 U.S. patent application Ser. No. 29/523,098 for HANDLE
 FOR A TABLET COMPUTER filed Apr. 7, 2015
 (Bidwell et al.);
 U.S. patent application Ser. No. 14/682,615 for SYSTEM
 AND METHOD FOR POWER MANAGEMENT OF
 MOBILE DEVICES filed Apr. 9, 2015 (Murawski et al.);
 U.S. patent application Ser. No. 14/686,822 for MULTIPLE
 PLATFORM SUPPORT SYSTEM AND METHOD filed
 Apr. 15, 2015 (Qu et al.);
 U.S. patent application Ser. No. 14/687,289 for SYSTEM
 FOR COMMUNICATION VIA A PERIPHERAL HUB
 filed Apr. 15, 2015 (Kohtz et al.);
 U.S. patent application Ser. No. 29/524,186 for SCANNER
 filed Apr. 17, 2015 (Zhou et al.);
 U.S. patent application Ser. No. 14/695,364 for MEDICA-
 TION MANAGEMENT SYSTEM filed Apr. 24, 2015
 (Sewell et al.);
 U.S. patent application Ser. No. 14/695,923 for SECURE
 UNATTENDED NETWORK AUTHENTICATION filed
 Apr. 24, 2015 (Kubler et al.);
 U.S. patent application Ser. No. 29/525,068 for TABLET
 COMPUTER WITH REMOVABLE SCANNING
 DEVICE filed Apr. 27, 2015 (Schulte et al.);

U.S. patent application Ser. No. 14/699,436 for SYMBOL READING SYSTEM HAVING PREDICTIVE DIAGNOSTICS filed Apr. 29, 2015 (Nahill et al.);

U.S. patent application Ser. No. 14/702,110 for SYSTEM AND METHOD FOR REGULATING BARCODE DATA INJECTION INTO A RUNNING APPLICATION ON A SMART DEVICE filed May 1, 2015 (Todeschini et al.);

U.S. patent application Ser. No. 14/702,979 for TRACKING BATTERY CONDITIONS filed May 4, 2015 (Young et al.);

U.S. patent application Ser. No. 14/704,050 for INTERMEDIATE LINEAR POSITIONING filed May 5, 2015 (Charpentier et al.);

U.S. patent application Ser. No. 14/705,012 for HANDSFREE HUMAN MACHINE INTERFACE RESPONSIVE TO A DRIVER OF A VEHICLE filed May 6, 2015 (Fitch et al.);

U.S. patent application Ser. No. 14/705,407 for METHOD AND SYSTEM TO PROTECT SOFTWARE-BASED NETWORK-CONNECTED DEVICES FROM ADVANCED PERSISTENT THREAT filed May 6, 2015 (Hussey et al.);

U.S. patent application Ser. No. 14/707,037 for SYSTEM AND METHOD FOR DISPLAY OF INFORMATION USING A VEHICLE-MOUNT COMPUTER filed May 8, 2015 (Chamberlin);

U.S. patent application Ser. No. 14/707,123 for APPLICATION INDEPENDENT DEX/UCS INTERFACE filed May 8, 2015 (Pape);

U.S. patent application Ser. No. 14/707,492 for METHOD AND APPARATUS FOR READING OPTICAL INDICIA USING A PLURALITY OF DATA SOURCES filed May 8, 2015 (Smith et al.);

U.S. patent application Ser. No. 14/710,666 for PRE-PAID USAGE SYSTEM FOR ENCODED INFORMATION READING TERMINALS filed May 13, 2015 (Smith);

U.S. patent application Ser. No. 29/526,918 for CHARGING BASE filed May 14, 2015 (Fitch et al.);

U.S. patent application Ser. No. 14/715,672 for AUGMENTED REALITY ENABLED HAZARD DISPLAY filed May 19, 2015 (Venkatesha et al.);

U.S. patent application Ser. No. 14/715,916 for EVALUATING IMAGE VALUES filed May 19, 2015 (Ackley);

U.S. patent application Ser. No. 14/722,608 for INTERACTIVE USER INTERFACE FOR CAPTURING A DOCUMENT IN AN IMAGE SIGNAL filed May 27, 2015 (Showering et al.);

U.S. patent application Ser. No. 29/528,165 for IN-COUNTER BARCODE SCANNER filed May 27, 2015 (Oberpriller et al.);

U.S. patent application Ser. No. 14/724,134 for ELECTRONIC DEVICE WITH WIRELESS PATH SELECTION CAPABILITY filed May 28, 2015 (Wang et al.);

U.S. patent application Ser. No. 14/724,849 for METHOD OF PROGRAMMING THE DEFAULT CABLE INTERFACE SOFTWARE IN AN INDICIA READING DEVICE filed May 29, 2015 (Barten);

U.S. patent application Ser. No. 14/724,908 for IMAGING APPARATUS HAVING IMAGING ASSEMBLY filed May 29, 2015 (Barber et al.);

U.S. patent application Ser. No. 14/725,352 for APPARATUS AND METHODS FOR MONITORING ONE OR MORE PORTABLE DATA TERMINALS (Caballero et al.);

U.S. patent application Ser. No. 29/528,590 for ELECTRONIC DEVICE filed May 29, 2015 (Fitch et al.);

U.S. patent application Ser. No. 29/528,890 for MOBILE COMPUTER HOUSING filed Jun. 2, 2015 (Fitch et al.);

U.S. patent application Ser. No. 14/728,397 for DEVICE MANAGEMENT USING VIRTUAL INTERFACES CROSS-REFERENCE TO RELATED APPLICATIONS filed Jun. 2, 2015 (Caballero);

U.S. patent application Ser. No. 14/732,870 for DATA COLLECTION MODULE AND SYSTEM filed Jun. 8, 2015 (Powilleit);

U.S. patent application Ser. No. 29/529,441 for INDICIA READING DEVICE filed Jun. 8, 2015 (Zhou et al.);

U.S. patent application Ser. No. 14/735,717 for INDICIA-READING SYSTEMS HAVING AN INTERFACE WITH A USER'S NERVOUS SYSTEM filed Jun. 10, 2015 (Todeschini);

U.S. patent application Ser. No. 14/738,038 for METHOD OF AND SYSTEM FOR DETECTING OBJECT WEIGHING INTERFERENCES filed Jun. 12, 2015 (Amundsen et al.);

U.S. patent application Ser. No. 14/740,320 for TACTILE SWITCH FOR A MOBILE ELECTRONIC DEVICE filed Jun. 16, 2015 (Bandringa);

U.S. patent application Ser. No. 14/740,373 for CALIBRATING A VOLUME DIMENSIONER filed Jun. 16, 2015 (Ackley et al.);

U.S. patent application Ser. No. 14/742,818 for INDICIA READING SYSTEM EMPLOYING DIGITAL GAIN CONTROL filed Jun. 18, 2015 (Xian et al.);

U.S. patent application Ser. No. 14/743,257 for WIRELESS MESH POINT PORTABLE DATA TERMINAL filed Jun. 18, 2015 (Wang et al.);

U.S. patent application Ser. No. 29/530,600 for CYCLONE filed Jun. 18, 2015 (Vargo et al.);

U.S. patent application Ser. No. 14/744,633 for IMAGING APPARATUS COMPRISING IMAGE SENSOR ARRAY HAVING SHARED GLOBAL SHUTTER CIRCUITRY filed Jun. 19, 2015 (Wang);

U.S. patent application Ser. No. 14/744,836 for CLOUD-BASED SYSTEM FOR READING OF DECODABLE INDICIA filed Jun. 19, 2015 (Todeschini et al.);

U.S. patent application Ser. No. 14/745,006 for SELECTIVE OUTPUT OF DECODED MESSAGE DATA filed Jun. 19, 2015 (Todeschini et al.);

U.S. patent application Ser. No. 14/747,197 for OPTICAL PATTERN PROJECTOR filed Jun. 23, 2015 (Thuries et al.);

U.S. patent application Ser. No. 14/747,490 for DUAL-PROJECTOR THREE-DIMENSIONAL SCANNER filed Jun. 23, 2015 (Jovanovski et al.); and

U.S. patent application Ser. No. 14/748,446 for CORDLESS INDICIA READER WITH A MULTIFUNCTION COIL FOR WIRELESS CHARGING AND EAS DEACTIVATION, filed Jun. 24, 2015 (Xie et al.).

* * *

In the specification and/or figures, typical embodiments of the invention have been disclosed. The present invention is not limited to such exemplary embodiments. The use of the term "and/or" includes any and all combinations of one or more of the associated listed items. The figures are schematic representations and so are not necessarily drawn to scale. Unless otherwise noted, specific terms have been used in a generic and descriptive sense and not for purposes of limitation.

The invention claimed is:

1. An electroencephalograph (EEG) point of sale system, comprising:
 - an EEG device that is configured to detect a plurality of electrical signals representing brain waves;
 - a database of brain wave profiles representing a plurality of items to be identified, wherein the brain wave profiles comprise electrical signals corresponding to the brain waves recorded during a training of the EEG point of sale system; and
 - a live signal analyzer that compares electrical signals from the EEG device with stored brain wave profiles in the database to identify entries in the database representing items that match the electrical signals from the EEG device, where items whose stored brain wave profiles match the electrical signals are considered identified items.
2. The system according to claim 1, further comprising a point of sale terminal coupled to the live signal analyzer that logs and tallies items for a transaction; and
 - where the live signal analyzer provides item identification and price data to the point of sale terminal for identified items.
3. The system according to claim 2, where the live signal analyzer comprises a programmed processor coupled to the EEG device, the point of sale terminal, and the database.
4. The system according to claim 1, where the EEG device is configured as headgear that is to be worn by a user.
5. The system according to claim 1, further comprising a brain response profiler that generates a brain response profile for an item from the EEG device and generates a database entry for the item.
6. The system according to claim 5, where the brain response profiler comprises a programmed processor coupled to the EEG device and the database.
7. The system according to claim 1, where the live signal analyzer identifies entries in the database representing items that match the electrical signals from the EEG device by

- cross correlating the plurality of electrical signals from the EEG device with stored database entries representing a plurality of items.
- 8. The system according to claim 1, where the electrical signals from the EEG device are converted to frequency domain signals and where the brain response profile is a frequency domain profile.
- 9. A method, comprising:
 - receiving, at a programmed processor, electroencephalograph (EEG) data generated by an EEG device when a user is exposed to an item that is to be identified;
 - comparing, via the programmed processor, the EEG data to a plurality of brain wave profiles stored in a database, the stored brain wave profiles corresponding to identifiable items, wherein the brain wave profiles comprise electrical signals corresponding to the brain waves recorded during a training using the EEG device;
 - ascertaining, based upon the results of the comparison, that a match exists between the EEG data and a stored brain wave profile for a particular identifiable item;
 - retrieving, via the programmed processor, information from the database associated with the particular identifiable item; and
 - passing the information retrieved from the database to a point of sale terminal.
- 10. The method according to claim 9, where the information retrieved from the database comprises item identification and price data.
- 11. The method according to claim 9, where the comparing comprises calculating a cross correlation between the EEG data and a plurality of the stored brain wave profiles.
- 12. The method according to claim 9, further comprising processing the EEG data using a fast Fourier transform.
- 13. The method according to claim 9, where the EEG data and the brain wave profiles are represented in the frequency domain.

* * * * *

专利名称(译)	使用脑电图进行产品识别		
公开(公告)号	US10373143	公开(公告)日	2019-08-06
申请号	US14/863681	申请日	2015-09-24
[标]申请(专利权)人(译)	手持产品公司		
申请(专利权)人(译)	手持产品, INC.		
当前申请(专利权)人(译)	手持产品, INC.		
[标]发明人	TODESCHINI ERIK		
发明人	TODESCHINI, ERIK		
IPC分类号	G06Q20/00 A61B5/0476 A61B5/16 G07G1/00 G06Q20/20 A61B5/00		
CPC分类号	G06Q20/201 A61B5/0476 G07G1/0036 A61B5/7264 G06Q20/208 A61B5/16 G16H50/20 A61B5/7267 G06F3/015		
其他公开文献	US20170091741A1		
外部链接	Espacenet		

摘要(译)

EEG POS系统具有EEG设备, 其检测表示脑电波的电信号。脑波轮廓的数据库表示要识别的多个项目。实时信号分析器将来自EEG设备的电信号与数据库中存储的脑波轮廓进行比较, 以识别数据库中表示与来自EEG设备的电信号匹配的项目的条目, 其中存储的脑波轮廓与电信号匹配的项目被认为是确定的项目。POS终端耦合到实时信号分析器, 以便记录和计算交易项目。

