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Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

Published:

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— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

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(54) Title: WEARABLE ELECTRIC, MULTI-SENSORY, HUMAN/MACHINE, HUMAN/HUMAN INTERFACES

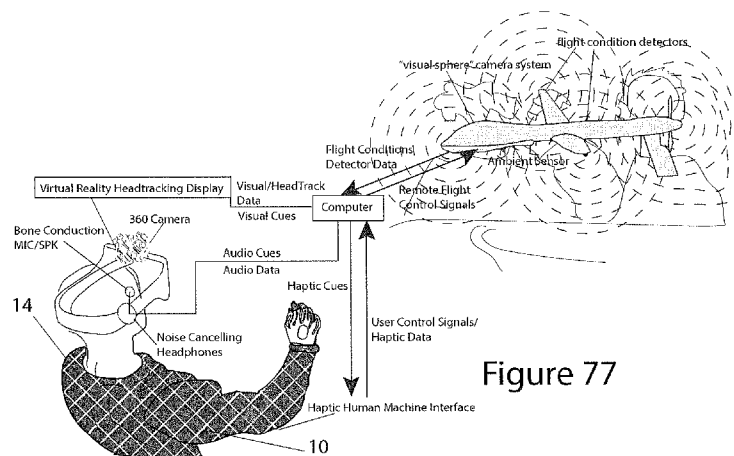


Figure 77

(57) Abstract: A wearable Haptic Human/Machine Interface (HMMI) receives electrical activity from muscles and nerves of a user. An electrical signal is determined having characteristics based on the received electrical activity. The electrical signal is generated and applied to an object to cause an action dependent on the received electrical activity. The object can be a biological component of the user, such as a muscle, another user, or a remotely located machine such as a drone. Exemplary uses include mitigating tremor, accelerated learning, cognitive therapy, remote robotic, drone and probe control and sensing, virtual and augmented reality, stroke, brain and spinal cord rehabilitation, gaming, education, pain relief, entertainment, remote surgery, remote participation in and/or observation of an event such as a sporting event, biofeedback and remotality. Remotality is the perception of a reality occurring remote from the user. The reality may be remote in time, location and/or physical form.

WO 2016/168117 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 16/26930

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A63B 69/00 (2016.01)

CPC - A63B 69/0053

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8): A63B 69/00 (2016.01)

CPC: A63B 69/0053

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

USPC: 434/247, 700/91;

IPC(8): A63B 69/00 (2016.01); CPC: A63B69/0053, A63B2102/24, A63B2243/0037, G09B19/0038, A63B71/0009

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase, ProQuest Dialog, Google Web, Google Patents (Search terms: haptic, tactile, feedback, cue, time sequential data, stimulate senses, synchronization, remote transmitter, virtual reality, simulated, augmented, remote control, drone, vehicle, touch, conductive patch, pad, electrical stimulation, shock, etc.)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---	US 2008/0103639 A1 (Troy et al.) 01 May 2008 (01.05.2008), para. [0020]-[0023], [0043]-[0044], [0047], [0050], [0069], [0076]-[0077], and [0081], and Figs. 3 and 8-9.	1-6, 53-54
Y		7-9, 55-57
Y	US 2009/0326406 A1 (Tan et al.) 31 December 2009 (31.12.2009), para. [0131]-[0132], [0135], and [0159].	7, 55
Y	US 2012/0035513 A1 (Afshar) 09 February 2012 (09.02.2012), para. [0039], [0054], [0059], and [0062].	8-9, 56-57
A	US 2007/0250119 A1 (Tyler et al.) 25 October 2007 (25.10.2007) (entire document).	1-9, 53-57

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 22 August 2016 (22.08.2016)	Date of mailing of the international search report 28 SEP 2016
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 16/26930

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

--see extra sheet--

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-9 and 53-57

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 16/26930

Continuation of Box III: Lack of Unity

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I: Claims 1-9, and 53-57 are drawn an apparatus/method for generating a haptic sensory cue that are synchronization dependent on the time sequential data and received by the user as an electrical signal.

Group II: Claims 10-14, and 58-62 are drawn to an interface for using conductive patches on the user's skin in order to stimulate electrical signal receptors.

Group III: Claims 15-23, and 63-70 are drawn to a method for generating visual sensory cues that are synchronized with the haptic sensory cues and displayed to the user.

Group IV: Claims 24-31, and 71-77 are drawn to a method for determining and generating a control signal that has characteristics of an electric activity from a muscle or nerve of a user and applying the control signal to an object.

Group V: Claims 32-42 are drawn to a method for detecting the onset of involuntary tremors and applying the electrical signals on the user using the human/machine interface in order to mitigate the tremors.

Group VI: Claims 43-52 are drawn to an apparatus generating haptic sensory cues and electrical signals to invoke an involuntary body part movement, and a perception of a user having a predetermined somatosensory sensation.

The inventions listed as Groups I through VI do not relate to a single general inventive concept under PCT Rule 13.1 because under PCT Rule 13.2 they lack the same or corresponding technical features for the following reasons:

The special technical feature of Group I is an apparatus/method for generating a haptic sensory cue that are synchronization dependent on the time sequential data and received by the user as an electrical signal, not required in any other group.

The special technical feature of Group II is an interface for using conductive patches on the user's skin in order to stimulate electrical signal receptors, not required in any other group.

The special technical feature of Group III is a method for generating visual sensory cues that are synchronized with the haptic sensory cues and displayed to the user, not required in any other group.

The special technical feature of Group IV is a method for determining and generating a control signal that has characteristics of an electric activity from a muscle or nerve of a user and applying the control signal to an object, not required in any other group.

The special technical feature of Group V is a method for detecting the onset of involuntary tremors and applying the electrical signals on the user using the human/machine interface in order to mitigate the tremors, not required in any other group.

The special technical feature of Group VI is an apparatus generating haptic sensory cues and electrical signals to invoke an involuntary body part movement, and a perception of a user having a predetermined somatosensory sensation, not required in any other group.

Common Features:

-Group I, II, III, and VI share a common technical feature of generating a plurality of haptic cues in the form of electrical signals; generating a plurality of haptic sensory cues capable of being perceived by a user. However, these shared technical features do not represent a contribution over the prior art:

US 2009/0326406 A1 (Tan et al.) (hereinafter Tan) 31 December 2009 (31.12. 2009)

Tan teaches generating a plurality of haptic cues in the form of electrical signals (e.g. the control feedback module 160 ...operates to provide haptic, visual, or audible feedback to the user to inform the user that a command has been successfully entered or executed in response to muscle generated electrical signals, para [0051]-[0052]); generating a plurality of haptic sensory cues capable of being perceived by a user (e.g. providing immediate haptic, audio, or visual feedback to the user, para [0038], [0051]-[0053], [0150]-[0153]).

-Group I through IV share a common technical feature of electrical signals/activity. However, these shared technical features do not represent a contribution over Tan.

Tan teaches electrical signals/activity (e.g. muscle generated electrical signals, para [0051]-[0052]; e.g. capture the electrical activity, para [0057]-[0058]).

-Continuation in next extra sheet-

-Continuation in preceding extra sheet-

-Groups I and VI share a common technical feature of generating a plurality of haptic sensory cues capable of being perceived by a user; wherein the haptic sensory cues are received by the user as computer controlled serially generated electrical signals, and wherein the electrical signals invoke a perception by the user. However, these shared technical features do not represent a contribution over Tan.

Tan teaches generating a plurality of haptic sensory cues capable of being perceived by a user (e.g. providing immediate haptic, audio, or visual feedback to the user, para [0038], [0051]-[0053], [0150]-[0153]); wherein the haptic sensory cues are received by the user as computer controlled serially generated electrical signals (e.g. the feedback a user receives visually when any command is initiated on a desktop computer, para [0147]; para [0066], [0150]-[0153]), and wherein the electrical signals invoke a perception by the user (e.g. generates electrical stimulus signals, para [0077]; e.g. haptic...feedback...create the sensation of a motion, para [0151]-[0153]).

-Group II and V share a common technical feature of a human/machine interface. However, these shared technical features do not represent a contribution over Tan.

Tan teaches a human/machine interface (e.g. human computer interface (Hci), abstract, para [0012], [0032]).

-Group I, II, III, IV, and VI share a common technical feature of a sense of touch/touch sensation or muscle movement/moveable member/muscle of the user. However, these shared technical features do not represent a contribution over Tan.

Tan teaches a sense of touch/touch sensation or muscle movement/moveable member/muscle of the user (e.g. electrodes that touch the skin...generating a stimulus signal, para [0099]; e.g. detect other electrical phenomena such as activity from other muscles, skin movement over muscles,...muscle movement, para [0061]).

-Group V and VI share a common technical feature of involuntary tremors/body part movement. However, these shared technical features do not represent a contribution over Tan in view of US 2007/0250119 A1 to Tyler et al. (hereinafter Tyler) 25 October 2007 (25.10.2007).

Tan fails to teach involuntary tremors/body part movement. However, Tyler, in an analogous art, teaches involuntary tremors/body part movement (e.g. eyes open and rapid onset of severe tremor, para [0802]; e.g. the tremor takes the form of a rhythmic back-and-forth motion of the thumb and forefinger, para [0855]; e.g. involuntary movement, para [0877]; para [0784]). It would have been obvious to one of ordinary skill in the art to have modified the system of Tan by including involuntary tremors/body part movement as taught by Tyler because the modification would provide enhanced physical and mental health and performance through sensory substitution, sensory enhancement, and related effects (Tyler, para [0003]).

-Groups I, III, IV, V and VI share a common technical feature of an apparatus, comprising at least one processor, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to perform. However, these shared technical features do not represent a contribution over Tan.

Tan teaches an apparatus (para [0165], [0167]-[0168]), comprising at least one processor (e.g. one or more processing unit(s) 1010, para [0167]-[0168]), and at least one memory including computer program code (e.g. storage 1060 that is either removable 1070 and/or non-removable 1080, para [0168]), the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to perform (para [0165], [0167]-[0168]).

Therefore, Groups I-VI lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.