A SPEECH-ACTUATED CONTROL SYSTEM FOR USE WITH A CONSUMER PRODUCT

SPRACHBETÄTIGTE STEUERUNGSSYSTEM FÜR GEBRAUCH MIT EINEM KONSUMERPRODUKT

SYSTÈME DE COMMANDE À ACTIONNEMENT VOCAL DESTINE À UN PRODUIT DE CONSOMMATION

Designated Contracting States: DE ES FR GB IT

Priority: 04.01.1995 EP 95200004


Proprietors:
- Koninklijke Philips Electronics N.V.
  5621 BA Eindhoven (NL)
  Designated Contracting States: DE ES FR GB IT
- Philips Corporate Intellectual Property GmbH
  52064 Aachen (DE)
  Designated Contracting States: DE

Inventors:
- HÄB-UMBACH, Reinhold
  D-52074 Aachen (DE)
- OP DE BEEK, Franciscus, Johannes
  NL-3818 WJ Amersfoort (NL)

Representative: Peters, Rudolf Johannes et al
INTERNATIONAAL OCTROOIBUREAU B.V.,
Prof. Holstlaan 6
5656 AA Eindhoven (NL)

References cited:
- EP-A- 0 218 073
- US-A- 4 637 045
- PATENT ABSTRACTS OF JAPAN, Vol. 11, No.
  231, E-527; & JP,A,62 047 295 (HONDA MOTOR
  CO LTD), 28 February 1987.

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
Description

FIELD OF THE INVENTION

[0001] The invention relates to a speech-actuated control system for use in a consumer product, said system comprising recognizer means for recognizing a speech command and sequencing means fed by said recognizer means for temporally subsequent to said recognizing effecting a change of state in said control system. Speech communication in a user interface organization has been described in EP-A-360 352. Prior art in EP-B1-78016 describes a system for recognizing a speech command subsequent to actuation of a mechanical switch that enables the recognition, whilst the speech recognition when effected, holds the command so recognized during a predetermined interval. The known system allows only a limited range of command specifications, inasmuch as only a single button is provided that controls the recognizer. The present inventor has found that inverting the sequence of recognizing and finalizing the command by means of button actuation allows a much wider range of commands and also allows a user interface that is felt as more sympathetic to the operator.

SUMMARY TO THE INVENTION

[0002] In consequence, amongst other things, it is an object of the present invention to smoothen the user interface of the system according to the preamble. Such consumer products should be designed for an inexperienced and non-professional user; typically they are operative for producing audio/video output. Now, according to one of its aspects, the invention is characterized in that said recognizer means are arranged for specifically recognizing a plurality of different commands and said system comprises mechanical user input means (actuator means) that are enabled by said sequencing means for then being receptive to a specifier command for specifying the most recently recognized speech command. Especially in a consumer electronics environment the effecting of the specifying after the speech recognition has been felt as extremely straightforward and little distractive to the inexperienced user person. One possibility would be that the specifier recurrently steps through a sequence of successive parameter values that are organized according to a circle. For example, if there are ten parameter values numbered 0 through 9, successive steps are from 0, 1, ... to 9 and then back to 0 for starting a new circle.

[0003] Advantageously, said mechanical actuator means are bidirectionally active for effecting a differential setting change in either of two opposite directions. It has been found that bidirectional differentials are easy to manipulate. In this case, still only two buttons need be present. The size of the differences may be discrete and one-shot, so that each actuation causes one finite step. Alternatively, prolonged actuation may cause a cumulating repetition of such steps. Still another possibility is that actuation causes a smooth variation in an associated direction.

[0004] Advantageously, said system comprising an enabling user input means (enabling actuator) for enabling said recognizing means. In this way, the recognition system is little error prone, because it is effectively disabled most of the time.

[0005] Advantageously, said system comprising continuously operative speech buffer means for receiving said speech, and said recognizer means being fed by said buffer means for allowing recognizing of speech received immediately before actuation of said enabling actuator. In this way, the speech command may begin some time before the actuation of the enabling actuator, while still rendering correct functionality.

[0006] The invention also relates to an automotive vehicle provided with a system according to the preceding. Especially in an automotive environment, the much-plagued driver should be distracted as little as possible. The one or more actuators according to the invention are advantageously physically integrated in the steering wheel or other mechanical steering activator. This no longer necessitates to take a hand from the steering actuator when a control setting is to be changed. Advantageously, a system according to the invention then allows for recognizing an RDS (Radio Data System) command. In this way, functionality is still further enhanced. The invention also relates to a remote control arrangement comprising a system according to the invention. Here, the recognition may be located inside the remote control device or in the controlled apparatus itself. In this way, the button count of the remote device may diminish dramatically.

[0007] Further advantageous aspects of the invention are recited in dependent Claims.

BRIEF DESCRIPTION OF THE DRAWING

[0008] These and other aspects and advantages will be described more in detail with reference to the description of referred embodiments hereinafter, and in particular with reference to the appended Figures that show:

Figure 1 a diagram of a motor vehicle having the invention;
Figure 2 a functionally integrated version of the actuators;
Figure 3 shows an exemplary block diagram of a motor vehicle containing the invention, which environment and embodiment should not be considered in a restrictive manner. Various subsystems of such a motor vehicle are common general knowledge and will not be considered in detail. According to the invention there is a microphone 22 provided with A/D conversion that recurrently samples the received speech. For simplicity, any analog signal filtering in the system is left out of consideration. Also, the mutual synchronization of the various subsystems is taken for granted. The samples are stored in a cyclic FIFO buffer 24 under control of cycling address controller 26. With respect to the present invention, a storage latency interval of 0.2-0.5 seconds is usually appropriate. As long as enabling actuator 28 is in rest, nothing happens. When the latter is however activated, speech recognizer 30 gets into operation. Alternatively, the speech recognizer is continuously operative. It may operate according to known principles and recognize any one amongst a plurality of commands that typically consist of a single word. After recognition, it may send an associated code and activation signal to the router subsystem 36. The latter remains activated for a predetermined interval, such as ten seconds, or alternatively, persistently. During activation the signals from actuators 32, 34 are sent to one of the destination control subsystems 38, 40, 42, that has been selected by the actually recognized command, for therein effecting differential changes in either of two opposite directions. The change may involve stepping in a particular direction, such as up versus down. Another possibility is a control signal for an analog motor that will turn left or right. A yes versus no choice is feasible as well. The mechanical actuators 32, 34 may keep their functionality after activation quasi-ininitely, or alternatively may have a default functionality, in that after the above interval of ten seconds they would again become operative for a particular control, either with respect to two opposite differential directions, or otherwise. A different detail may be that the actuators 28, 32, and 34 are functionally integrated, which may be done in various different ways. A first one is that the default functionality of actuators 32, 34 represents the one of actuator 28. A second one could be that co-actuation of both of actuators 32, 34 would represent actuation of actuator 28. Generally, all actuators are pushbutton, but this is not an effective limitation. They could be as well soft keyboard parts, a single toggle button, or otherwise. A programmed extra may be that the timeout of router 36 is reset after a subsequent command has been recognized by recognizer 30.

Various elements of the motor vehicle may be controlled by the system as shown:

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Car radio</td>
<td>station by name or frequency value (this could lead automatically to the up-down controllability of the audio volume through the bidirectional differential setting)</td>
</tr>
<tr>
<td>b. CD-player</td>
<td>title list (scanning) audio controls (as a.)</td>
</tr>
<tr>
<td>c. Car telephone</td>
<td>personal directory (scan)</td>
</tr>
<tr>
<td>d. Navigation System</td>
<td>call destination (scan)</td>
</tr>
<tr>
<td>e. RDS</td>
<td>call program type (scan)</td>
</tr>
<tr>
<td>f. Car functionality</td>
<td>windows (up/down) temperature control (up/down)</td>
</tr>
</tbody>
</table>

Figure 2 shows a functionally integrated version of the actuators. The central button activates the recognition operation. The advantage of such a recognition actuator is that spurious recognition of spoken terms which can occur in unrelated text is now generally avoided. Also, the provision of various parallel voice recognition channels, such as for dictation, car telephone and others, becomes feasible without mutual interference. When the speech has been recognized, the upper button 1 and lower button 2 become operational for a particular functionality and during a predetermined interval, that may be infinite. Subsequently, they may either become "dead", get a default functionality, or maintain their old functionality. The three buttons may be integrated still further, such as by:

- assigning the function of button 3 to either one among buttons 1, 2.
- assigning the function of button 3 to the combined actuation of buttons 1, 2. Both integrations leave out button 3 itself.

The actuators when used in a motor vehicle, may be physically integrated with the steering wheel or steering actuator of another type.

Figure 3 shows a front of a car audio device for use with the invention. By itself the front may be conventional, but leaving out various up/down actuators may bring about a cleaner appearance front, and/or may allow for a smaller front size. The prominent display top left shows actual broadcast frequency and character of the tuned station; also actual loudness level is indicated. Various standard actuators have been shown for bass balance, treble fader, previous
and next tune, and manual scan (in recorder deck facility, such as digital compact cassette or CD), mode (such as AM versus FM), TA (Traffic Announcements, that is a functionality of the Radio Data System principle, wherein a most recently received traffic announcement is stored, and then upon activation of the TA button, retrieved from storage), mono/stereo, waveband, and a few others, that are irrelevant to the present invention. Also buttons for six preferential stations are available. Various ones of the incremental controls shown may be rendered programmable according to the invention. In doing so, the original standard button(s) may either be retained or omitted. Incremental controls so programmable may selectively relate to various different consumer products integrated together, such as in a motor vehicle, or in a stereo tower. A different embodiment is that the one or more buttons according to Figure 2 are present on a remote control device for such stereo tower, household appliance, or other consumer device or system. The lowering of the number of buttons on such device renders it less error-prone. Also an improved look of the remote control device may result. If the user of such remote control device has forgotten the appropriate commands, these may be scrollably shown on a small display, either on the remote control device itself, or on the apparatus controlled thereby.

Figure 4 shows a flow chart for use with the invention. In block 50, the system is rendered operational, such as by inserting the ignition key. In block 52, the system detects actuation of button 3 in Figure 2. If no, a waiting loop is executed, and the system reverts to block 52. When actuation has taken place, in block 54 actual speech recognition is executed. If failed, the system reverts once more to block 52 (not shown). In block 56 it is detected whether the recognized speech term is a final one or should be followed by one or more subsequent qualifier terms. For example, if radio data is present, the recognizer may be able to recognize the actual name of an intended station, whereas the internal management will then associate the code thereof received by RDS with an optimum frequency. Likewise, the user may give a verbal request for a particular type of program, such as "classical music", "jazz music", or "news". Also then, the system chooses a particular station, that is judged as the best one. For example, it is the one with the strongest signal. Subsequent control of the reception is effected by the up/down button pair. If the final term has been recognized in block 54, the system will directly go to block 58. In block 58, the target functionality is selected (broadcast frequency, loudness, windows up/down, etcetera). Blocks 60, 62, 64 constitute a waiting loop that is recurrently traversed until either one of the up/down buttons is activated (blocks 60, 62), or until the predetermined time has lapsed (64), or alternatively, until a new functionality will have been rendered programmable through appropriate speech input. In the latter case, the return from blocks 64, 68, 70 should go to the block 52. If the button is actuated, the associated differential setting change is effected (Blocks 68, 70), and the system reverts to block 60. When time has finished, the system goes to block 66: stop. In fact, the latter may also allow reentrance to block 52. Detecting a power-off switching at an appropriate part of the loop may represent an alternative termination.

Various refinements may be introduced to cope with user errors or to extend the functionality.

Claims

1. A speech-actuated control system for use in a consumer product, said system comprising recognizer means (30) for recognizing a speech command and sequencing means fed by said recognizer means (30) for temporally, subsequent to said recognizing effecting a change of state in said control system, characterized in that said recognizer means (30) are arranged for specifically recognizing a plurality of different commands and said system comprises mechanical user input means (32,34) that are enabled by said sequencing means for then being receptive to a specifier command for specifying the most recently recognized speech command.

2. A system as claimed in Claim 1, wherein said mechanical user input means (32,34) are bidirectionally active for effecting a differential setting change in either of two opposite directions.

3. A system as claimed in Claim 2, wherein said setting change is discrete and cumulative.

4. A system as claimed in Claims 1, 2 or 3, comprising an enabling user input means (28) for enabling said recognizing means (30).

5. A system as claimed in Claim 4, and comprising continuously operative speech buffer means (24) for receiving said speech, and said recognizer means (30) being fed by said buffer means for allowing recognizing of speech received immediately before actuation of said enabling user input means (28).

6. A system as claimed in Claim 4 or 5, wherein said enabling user input means is functionally integrated with said mechanical user input means.
7. A system as claimed in any of Claims 1 to 6, and having timeout means for, under control of any of said recognizing or actuating or disactuating of said enabling user input means, starting a fixed-length time-out interval in which the mechanical user input means is receptive to the specifier command for specifying the most recently recognized speech command.

8. A system as claimed in any of Claims 1 to 7 for controlling a radio, CD-player, cassette-player, telephone, or navigation system.

9. A system as claimed in any of Claims 1 to 8 wherein said mechanical user input means have a default functionality.

10. A remote control arrangement comprising a system as claimed in any of Claims 1 to 9.

11. A motor vehicle (20) provided with a system as claimed in any of Claims 1 to 10.

12. A motor vehicle as claimed in Claim 11 and having said mechanical user input means (32,34) and/or said enabling user input means (28) physically integrated in its steering actuator.

13. A motor vehicle as claimed in Claims 11 or 12, and having any of said mechanical user input means and/or said enabling input means enabling a recognition of a spoken command of a user for controlling an RDS radio, where the spoken command relates to RDS data, such as station name or program type.

Patentansprüche


2. System nach Anspruch 1, wobei die genannten mechanischen Benutzereingabemittel (32, 34) bidirektionell aktiv sind zum Effektuieren einer differenziellen Einstellungsänderung in den beiden entgegengesetzten Richtungen.

3. System nach Anspruch 2, wobei die genannte Einstellungsänderung diskret und kumulativ ist.

4. System nach Anspruch 1, 2 oder 3, mit Freigabebenutzereingangsmitteln (28) zum Freigeben der genannten Erkennungsmittel (30).

5. System nach Anspruch 4, mit kontinuierlich wirksamen Sprachpuffermitteln (24) zum Empfangen der genannten Sprache, wobei die genannten Erkennungsmittel (30) von den genannten Puffermitteln gespeist werden, damit sie Sprache erkennen, die unmittelbar vor der Aktivierung der genannten Freigabebenutzereingangsmittel (28) empfangen worden ist.

6. System nach Anspruch 4 oder 5, wobei die genannten Freigabebenutzereingabemittel funktionell mit den genannten mechanischen Benutzereingabemitteln integriert sind.

7. System nach einem der Ansprüche 1 bis 6, mit Zeitabschaltungszeiten zum unter Ansteuerung eines der genannten Erkennungs-, Aktivierungs- oder Abschaltmittel der genannten Benutzereingabemittel, ein festlängenzzeitabschaltungsintervall zu starten, in dem die mechanischen Benutzereingabemittel empfänglich sind für den Spezifizierbefehl zum Spezifizieren des jüngsten erkannten Sprachbefehls.


9. System nach einem der Ansprüche 1 bis 8, wobei die genannten mechanischen Benutzereingabemittel eine Vor-
gabefunktionalität haben.

10. Fernsteuereinrichtung mit einem System nach einem der Ansprüche 1 bis 9.

11. Kraftfahrzeug (20) mit einem System nach einem der Ansprüche 1 bis 10.


13. Kraftfahrzeug nach Anspruch 11 oder 12, wobei die mechanischen Benutzereingabemittel und/oder die genannten Freigabeeingabemittel, die eine Erkennung eines gesprochenen Befehls eines Benutzers freigeben zur Steuerung eines RDS-Rundfunkempfängers, wobei der gesprochene Befehl in einem Verhältnis zu den RDS-Daten steht, wie ein Sendername oder ein Programmtyp.

Revidendations

1. Système de commande à actionnement vocal destiné à être utilisé dans un produit de consommation, ledit système comprenant des moyens de reconnaissance (30) pour reconnaître une commande vocale et des moyens de séquençement alimentés par lesdits moyens de reconnaissance (30) pour, temporellement après ladite reconnaissance, effectuer un changement d'état dans ledit système de commande, caractérisé en ce que lesdits moyens de reconnaissance (30) sont prévus pour reconnaître spécifiquement un pluralité de commandes différentes et ledit système comprend des moyens d'entrée d'utilisateur mécaniques (32, 34) qui sont activés par lesdits moyens de séquençement pour être ensuite réceptifs à une commande de spécification pour spécifier la commande vocale reconnue le plus récemment.

2. Système suivant la revendication 1, dans lequel lesdits moyens d'entrée d'utilisateur mécaniques (32, 34) sont actifs de manière bidirectionnelle pour effectuer un changement de réglage différentiel dans l'une ou l'autre de deux directions opposées.

3. Système suivant la revendication 2, dans lequel ledit changement de réglage est discret et cumulatif.

4. Système suivant les revendications 1, 2 ou 3, comprenant des moyens d'entrée d'utilisateur d'activation (28) pour activer lesdits moyens de reconnaissance (30).

5. Système suivant la revendication 4, et comprenant des moyens de tamponnement de la parole à fonctionnement continu (24) pour recevoir ladite parole, et lesdits moyens de reconnaissance (30) étant alimentés par lesdits moyens de tamponnement pour permettre la reconnaissance de la parole reçue immédiatement avant l'actionnement desdits moyens d'entrée d'utilisateur d'activation (28).

6. Système suivant la revendication 4 ou 5, dans lequel lesdits moyens d'entrée d'utilisateur d'activation sont fonctionnellement intégrés avec lesdits moyens d'entrée d'utilisateur mécaniques.

7. Système suivant l'une quelconque des revendications 1 à 6, et comportant des moyens de temporisation pour, sous la commande de l'un quelconque des moyens de reconnaissance, d'actionnement ou de mise à l'arrêt desdits moyens d'entrée d'utilisateur d'activation, démarrer un intervalle de temporisation de durée fixe durant lequel les moyens d'entrée d'utilisateur mécaniques sont réceptifs à la commande de spécification pour spécifier la commande vocale reconnue le plus récemment.

8. Système suivant l'une quelconque des revendications 1 à 7 pour commander une radio, un lecteur de CD, un lecteur de cassette, un téléphone ou un système de navigation.

9. Système suivant l'une quelconque des revendications 1 à 8, dans lequel lesdits moyens d'entrée d'utilisateur mécaniques possèdent une fonctionnalité par défaut.

10. Dispositif de commande à distance comprenant un système suivant l'une quelconque des revendications 1 à 9.

11. Véhicule automobile (20) équipé d'un système suivant l'une quelconque des revendications 1 à 10.
12. Véhicule automobile suivant la revendication 11 et comportant lesdits moyens d'entrée d'utilisateur mécaniques (32, 34) et/ou lesdits moyens d'entrée d'utilisateur d'activation (28) intégrés physiquement dans son actionneur de direction.

13. Véhicule automobile suivant la revendication 11 ou 12, et comportant l'un quelconque desdits moyens d'entrée d'utilisateur mécaniques et/ou desdits moyens d'entrée d'activation activant une reconnaissance d'une commande prononcée par un utilisateur pour commander une radio RDS, la commande prononcée concernant des données RDS, telles qu'un nom de station ou un type de programme.