(12) UK Patent Application (19) GB (11) 2 296 341 (13) A

(43) Date of A Publication 26.06.1996

(21) Application No 9423931.6

(22) Date of Filing 26.11.1994

(71) Applicant(s)
Motorola Limited

(Incorporated in the United Kingdom)

European Intellectual Property Operation, Jays Close, Viables Industrial Estate, BASINGSTOKE, Hampshire, RG22 4PD, United Kingdom

(72) Inventor(s)
William Neil Robinson

(74) Agent and/or Address for Service
Hugh Christopher Dunlop
Motorola Limited, European Intellectual Property Operation, Jays Close, Viables Industrial Estate, BASINGSTOKE, Hampshire, RG22 4PD, United Kingdom

(51) INT CL[6]
H03J 1/02

(52) UK CL (Edition O)
G3N NG1A2 N287 N390 N407
H3Q QLCX Q200
U1S S2205

(56) Documents Cited
EP 0031589 A2 **US 4393277 A** **US 4392246 A**

(58) Field of Search
UK CL (Edition N) **G3N NG1A1 NG1A2 , H3Q QLCX**
INT CL[6] **H03J 1/02**

(54) **Electronic equipment with input elements and speech generator**

(57) Electronic equipment such as a mobile radio is described having a number of buttons or other input elements (22). Functional circuitry eg a radio transceiver (10) is operably coupled to the input elements (22) for control by a user. A speech generator (26) is coupled to the input elements (22) for generation, in response to activation of each of the input elements (22) of speech indicative of the function of that input element (22). An audio output element (28) enunciates the speech to the user. Other applications are to a washing machine or a computer.

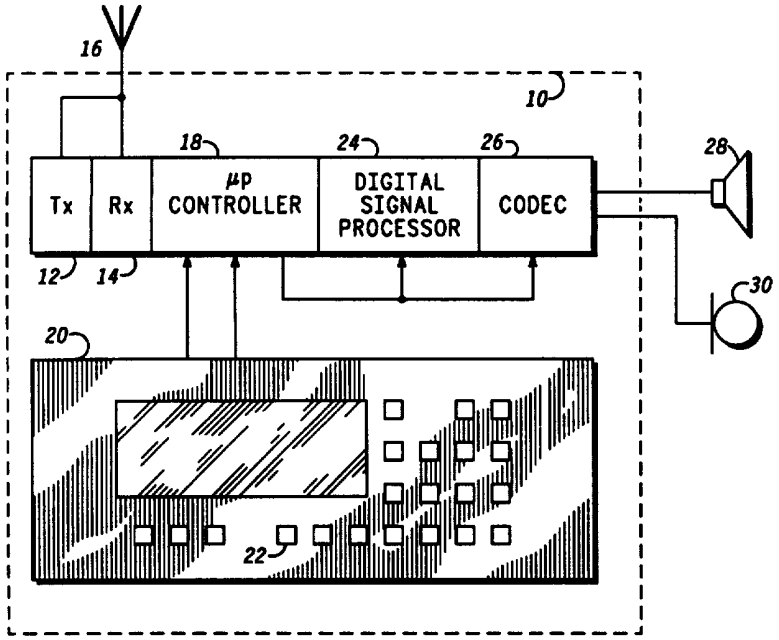

FIG. 1

GB 2 296 341 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

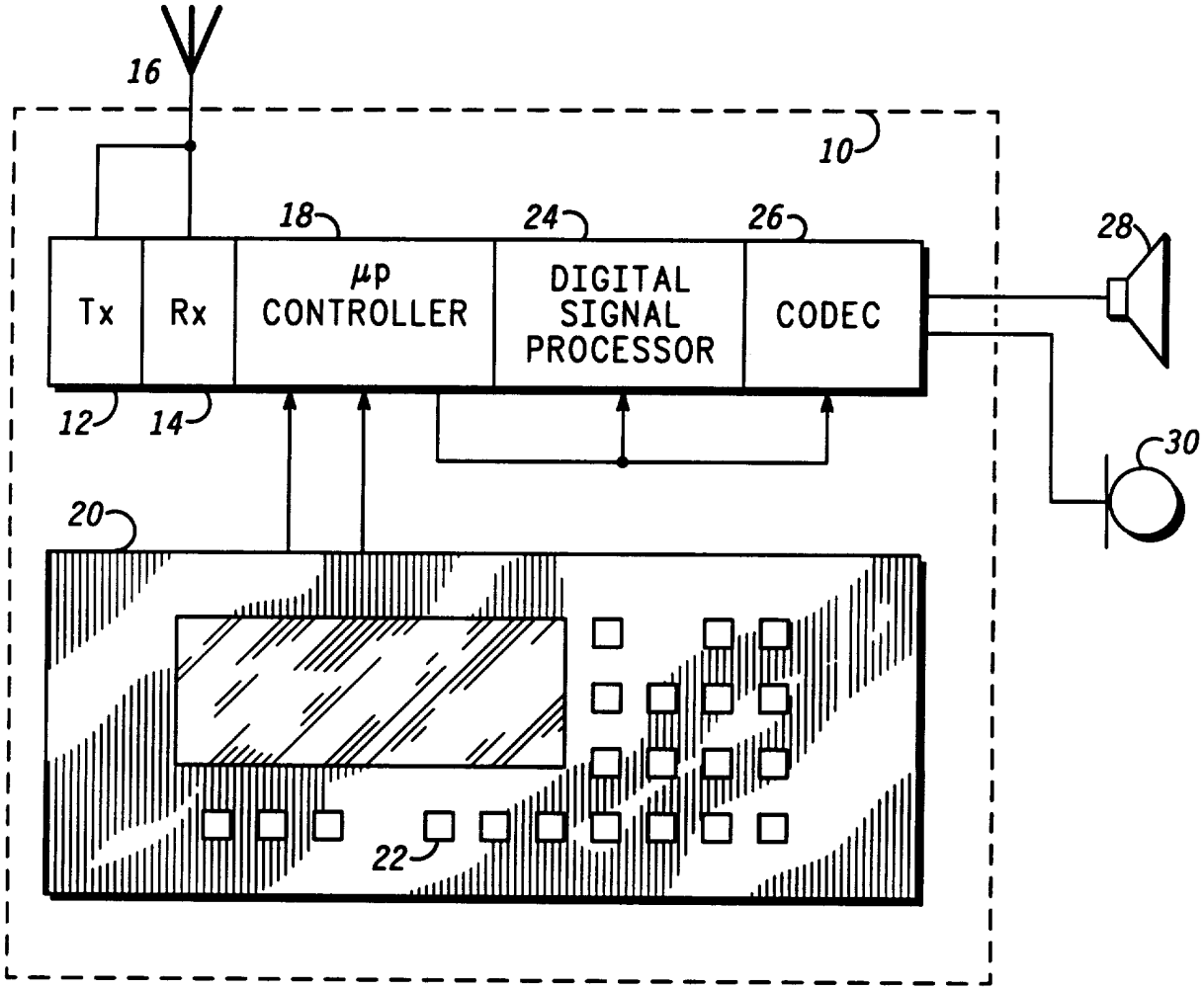
16
10
18
24
26
28
Tx
Rx
μP CONTROLLER
DIGITAL SIGNAL PROCESSOR
CODEC
12
14
30
20
22

FIG. 1

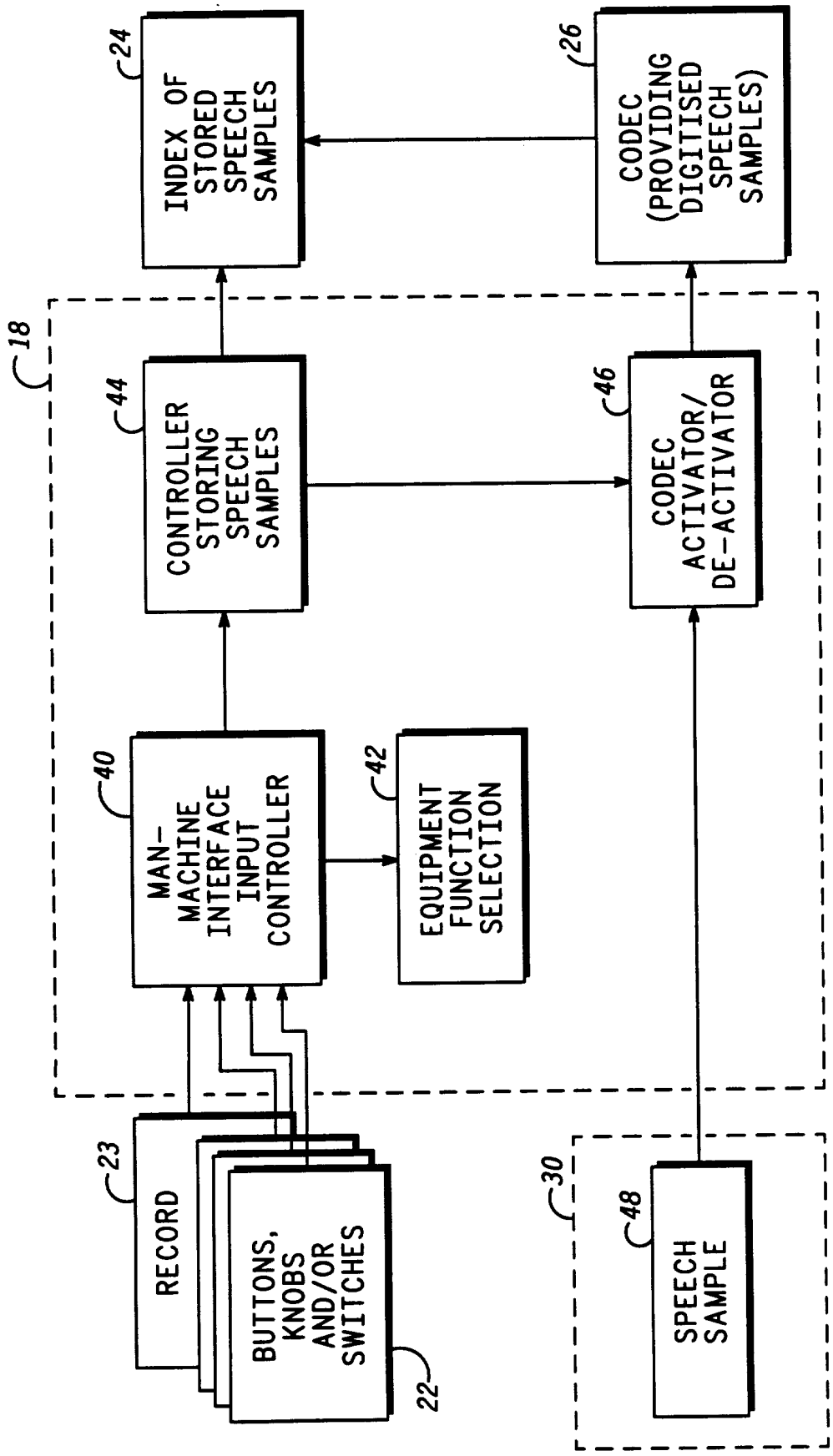
24
INDEX OF STORED SPEECH SAMPLES
26
CODEC (PROVIDING DIGITISED SPEECH SAMPLES)
18
44
CONTROLLER STORING SPEECH SAMPLES
46
CODEC ACTIVATOR/ DE-ACTIVATOR
40
MAN-MACHINE INTERFACE INPUT CONTROLLER
42
EQUIPMENT FUNCTION SELECTION
23
RECORD
BUTTONS, KNOBS AND/OR SWITCHES
22
30
48
SPEECH SAMPLE

FIG. 2

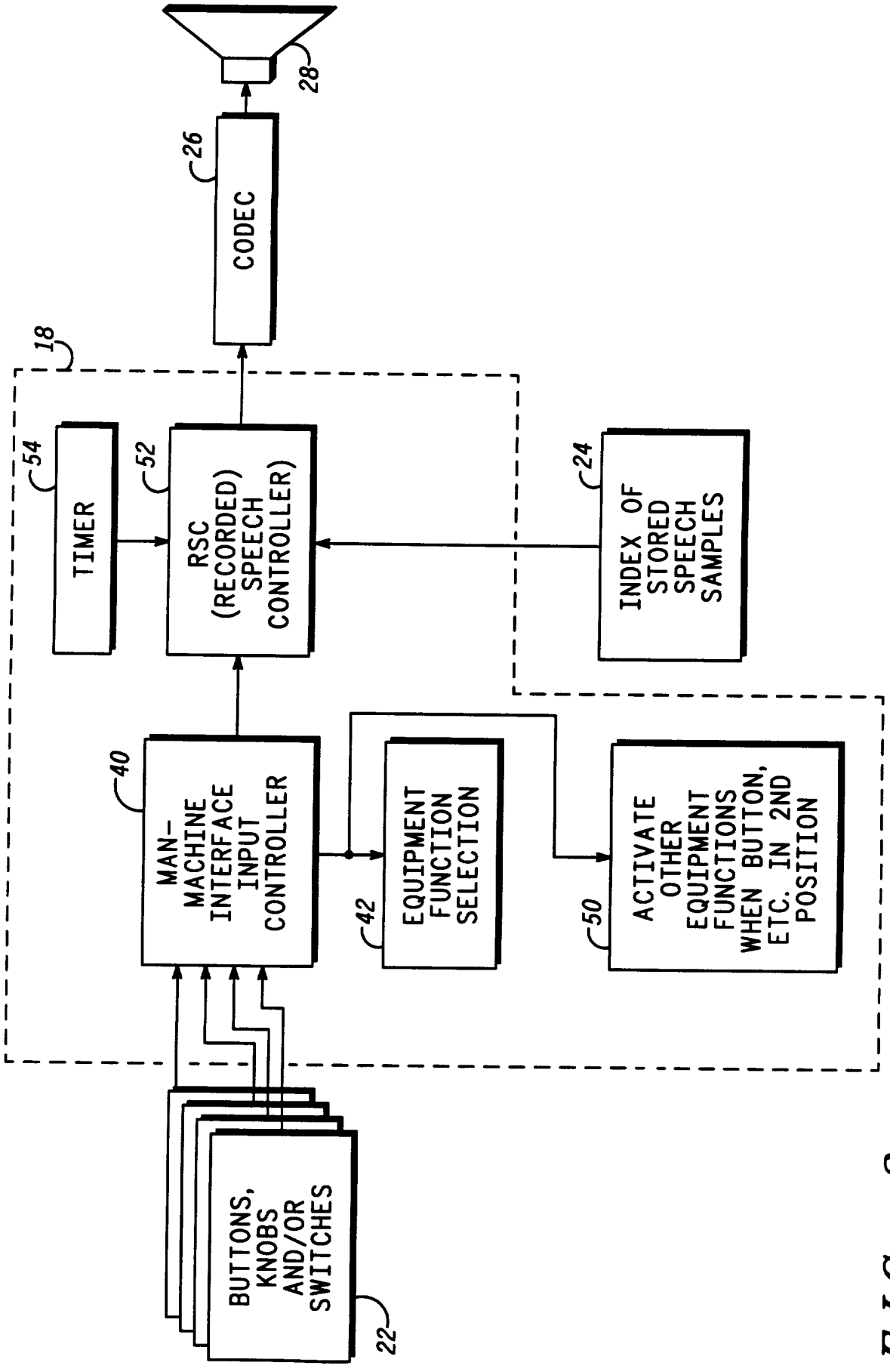
28
26
CODEC
18
54
TIMER
52
RSC (RECORDED) SPEECH CONTROLLER)
24
INDEX OF STORED SPEECH SAMPLES
40
MAN-MACHINE INTERFACE INPUT CONTROLLER
42
EQUIPMENT FUNCTION SELECTION
50
ACTIVATE OTHER EQUIPMENT FUNCTIONS WHEN BUTTON, ETC. IN 2ND POSITION
BUTTONS, KNOBS AND/OR SWITCHES
22

FIG. 3

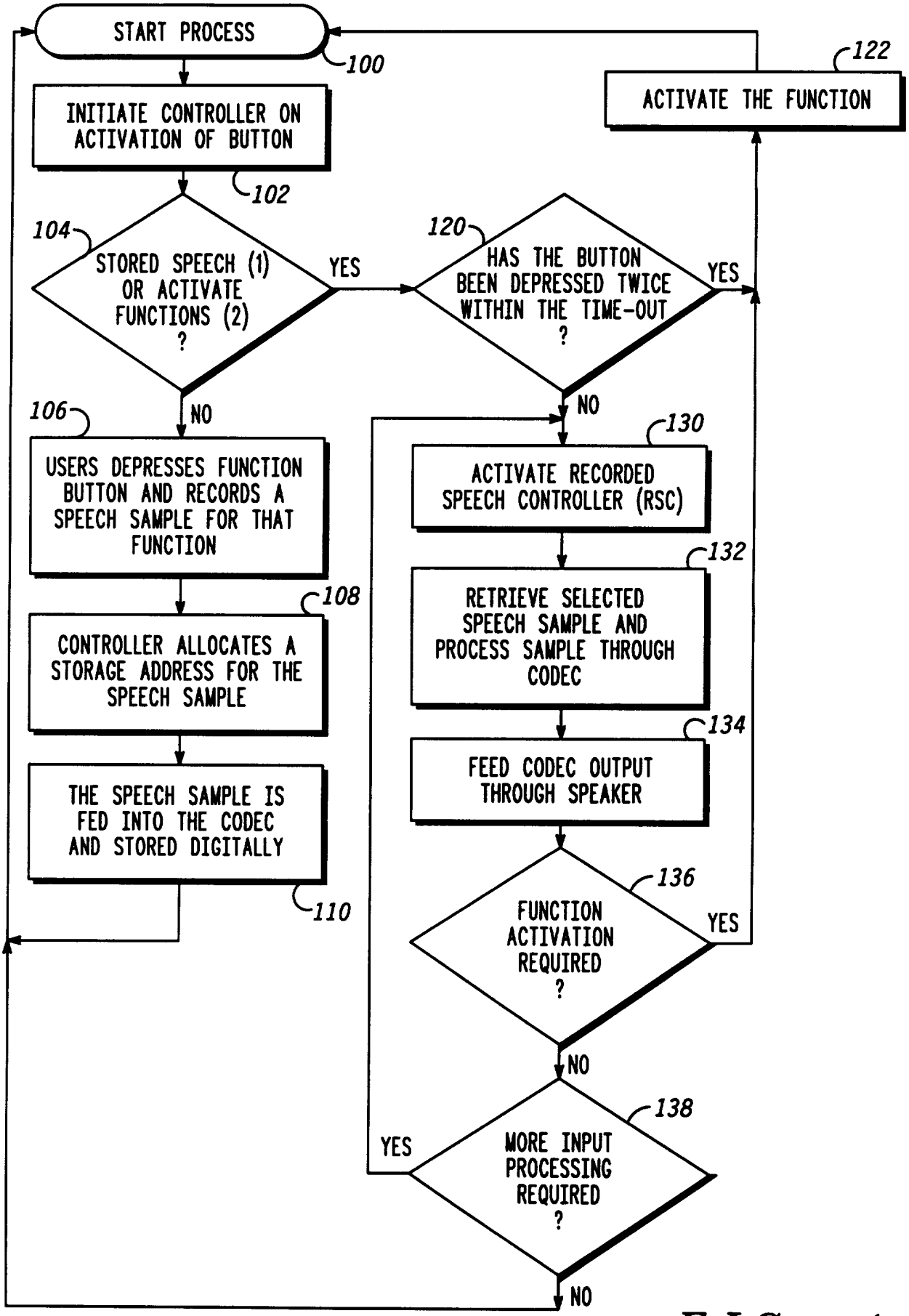
START PROCESS
100
INITIATE CONTROLLER ON ACTIVATION OF BUTTON
102
104
STORED SPEECH (1) OR ACTIVATE FUNCTIONS (2) ?
YES
120
HAS THE BUTTON BEEN DEPRESSED TWICE WITHIN THE TIME-OUT ?
YES
122
ACTIVATE THE FUNCTION
NO
106
USERS DEPRESSES FUNCTION BUTTON AND RECORDS A SPEECH SAMPLE FOR THAT FUNCTION
108
CONTROLLER ALLOCATES A STORAGE ADDRESS FOR THE SPEECH SAMPLE
THE SPEECH SAMPLE IS FED INTO THE CODEC AND STORED DIGITALLY
110
NO
130
ACTIVATE RECORDED SPEECH CONTROLLER (RSC)
132
RETRIEVE SELECTED SPEECH SAMPLE AND PROCESS SAMPLE THROUGH CODEC
134
FEED CODEC OUTPUT THROUGH SPEAKER
136
FUNCTION ACTIVATION REQUIRED ?
YES
NO
138
MORE INPUT PROCESSING REQUIRED ?
YES
NO

FIG. 4

Electronic Equipment with Input Elements and Speech Generator

Field of the Invention

This invention relates to electronic equipment having a plurality of user-actuable input elements, such as a keypad or channel selector buttons or other control knobs, buttons etc. The invention is applicable to, but not limited to, use in mobile radio apparatus.

Background to the Invention

Many vehicles are now fitted with a number of driver-operated electronic units. These electronic units include mobile radio apparatus, mobile telephones and radio cassette equipment. Operating these units without taking one's eyes off the road, mirrors, etc. is both difficult and dangerous. It would therefore be helpful to the driver if the operation of these units could be controlled by the driver whilst not affecting the concentration required for driving.

Additionally it is a problem with modern electronic equipment, such as vehicle radios, that many buttons are presented with complex functionality which is confusing to the user. Often the buttons are very small requiring close inspection to read any labels or other information presented. Often the environment is dark and the input elements are difficult to see.

This invention seeks to mitigate some or all of the problems associated with existing electronic equipment.

Summary of the Invention

According to the invention, electronic equipment is provided comprising: a plurality of user-actuable input elements; functional circuitry operably coupled to the input elements for control by a user; and a speech generator, coupled to the input elements for generation, in response to activation of each of the input elements, speech indicative of the function of that input element. An audio output element enunciates the speech to the user.

In this manner, the equipment can inform the user, through recorded voice, as to the function of a button, knob or other input element that the user is operating, is about to operate or has operated.

Preferably at least one of the plurality of user-actuable input elements comprises at least one two-stage input element operably coupled to the speech generator and to the functional circuitry, for causing the speech generator to generate speech in response to a first stage of actuation and for controlling the functional circuitry in response to a second stage of actuation.

In this manner, the user can be informed of the function of the user input element (at the first stage of actuation) before the second stage of actuation controls the functional circuitry.

The two-stage input element may be an input element with a timer for timing double actuation of the input element, or it may be an input element with two different mechanical or electrical stages of actuation.

A storage element may be provided for storing speech samples, and the functional circuitry may include communications circuitry coupled to the speech generator for generating speech from speech samples communicated through the communications circuitry. In this arrangement, the speech generator is coupled to the storage element for retrieving speech samples from the storage element and generating speech therefrom in response to activation of the input elements.

This arrangement has the advantage of using the same speech generator (e.g. digital signal processor or codec) for both the communications circuitry and the speech generator.

In a preferred embodiment a timing function is provided, operatively coupled to at least one of the input elements and to the speech generator for timing sequential actuations of at least one of the input elements, such that sequential operation within a time-out period causes control of the functional circuitry without generation of speech by the speech generator.

This feature is useful to the user who is acquainted with the function of the input element being operated and wishes to over-ride the generation of speech.

A preferred embodiment of the invention will now be described, by way of example only, with reference to the drawings.

Brief Description of the Drawings

FIG. 1 shows a schematic block diagram of a known radio communications transceiver in accordance with the preferred embodiment of the invention.

FIG. 2 shows a block diagram of a process for storing speech samples in the radio communications transceiver of FIG. 1.

FIG. 3 shows a block diagram of a process for retrieving speech samples or activating other functions of the radio communications transceiver of FIG. 1.

FIG. 4 shows a flow diagram of a software program operated by the microprocessor-based control unit of FIG. 1.

Detailed Description of Drawings

Referring first to FIG. 1, a schematic block diagram of a radio communications transceiver 10 is shown, in accordance with the preferred embodiment of the invention. The radio communications transceiver 10 comprises a transmitter 12 and a receiver 14 which respectively provide signals to and receive signals from an antenna 16. The radio communications transceiver 10 also consists of a controller 18 which is connected to a DSP and memory unit 24, an audio processing unit 26 and a number of input elements 22 via a man-machine interface 20. The controller may be microprocessor based. The audio processing unit 26 is connected to a speaker 28 and a microphone 30.

The controller 18 controls the digital speech encoding or decoding of the audio processing unit 26. The controller 18 also controls the flow of speech information between the memory unit 24 and either the speaker 28 or the microphone 30 via the audio processing unit 26. The user can program, set or activate a number of operations of the radio communications transceiver 10, according to various options associated with the particular input elements 22. The ability to program and control the operation of the radio communications transceiver 10, by solely pressing a particular input element 22 in response to the pre-programmed speech messages, without looking at the transceiver 10, is a major advantage to the user.

The input elements 22 are two-stage input elements. A possible mechanical embodiment of a two-stage input element is shown in UK Patent Application GB 2 241 333A, however in the preferred embodiment of the present invention, as is described below with reference to FIGS. 3 and 4, each two-stage input element comprises a timer function.

Referring now to FIG. 2, a block diagram is shown detailing the processing steps for storing speech samples in the radio communications transceiver 10 of FIG. 1. The controller 18 comprises a man-machine interface input controller 40 that relates the input elements 22 to particular equipment functions 42. In the preferred embodiment one of the input elements 22 is a record button 23. The controller 18 also comprises a control function 44 for storing speech samples and a codec activator/de-activator unit 46. A speech sample 48 is transmitted from the microphone unit 30 to the codec activator/de-activator unit 46.

The process of storing a sample of speech for a particular equipment function 42 requires the user to activate both the appropriate input element 22 and the record button (input element) 23.

Within the controller 18, the control function 44 for storing speech samples ensures that an appropriate address is allocated in the memory unit 24 when the record button 23 is activated. The control function 44 also switches on the codec activator/de-activator 46 so that the speech sample 48 is passed to the codec 26. The encoded speech sample for the activated input element 22 is then stored in the memory unit 24 at the address chosen.

Referring now to FIG. 3, a block diagram is shown detailing the processing steps of retrieving speech samples in the digital radio communications transceiver 10 of FIG. 1. The speech sample associated with the activation of a particular input element 22 is retrieved by the controller 18 from the memory unit 24. In addition to the blocks shown in FIG. 2, the controller 18 also comprises: an element 50 to activate or program functions on the occurrence of further user inputs; a recorded speech controller 52 and a timer function 54.

To retrieve speech associated with a particular equipment function 42, a user activates the appropriate input element 22. This activation is linked to the particular equipment function 42 by the man-

machine interface controller 40. The recorded speech controller (RSC) 52 then retrieves the desired speech sample from the memory unit 24 according to timer control inputs from the timer unit 54. The digitised speech sample is then decoded by the codec 26 and the recovered speech is output to the speaker 28.

In the preferred embodiment the controller 18 shown in FIG. 1 executes the program detailed in FIG. 4.

Upon activation of an input element 22 the program starts (step 100) and the controller 18 is initiated (step 102). The controller 18 then determines whether a speech message is to be stored or whether the user requires information on the activated input element 22 (step 104).

If speech is to be stored the user activates the "record" input element 23 as well as a function input element 22 and records a speech sample for the function chosen (step 106). The controller 18 then allocates an address in the memory unit 24 for the speech sample 48 (step 108). The speech sample 48 is then fed into the codec 26, digitised and stored in the memory unit 24 (step 110). The controller 18 then enters an idle mode awaiting further activation of input elements 22.

In the preferred embodiment a time-out option has been included. If the input element 22 is activated twice within a specified time-out period (step 120), the function chosen by the user is activated automatically (step 122). This obviates the need for the controller 18 to provide the speech sample associated with that particular input element 22. This option offers the user a faster, more efficient way of activating equipment functions 42.

If the time-out option has not been activated, the recorded speech controller 52 is accessed (step 130). The selected speech sample 48 associated with the chosen input element 22 is retrieved from the memory unit 24 and processed through the codec 26 (step 132). The speech output from the codec is then fed into the speaker 28 (step 134).

At this point (136) the function can be activated (122) by the user. Alternatively the function may require additional processing steps or the user may decide to fine-tune the equipment function 42 with further or sustained activations of the input element 22 (step 138). This process may include further speech instructions from the controller 18 as shown in FIG. 3 with the program detailed in FIG. 4 looping around steps 130,

132, 134, 136 and 138. When the input element 22 has been activated and no further options or user controls are required, the controller 18 will return to an idle mode.

Instead of the user recording the speech samples for the particular equipment functions 42 and input elements 22, the speech samples may be pre-recorded during manufacturing of the radio communications transceiver 10. Providing the user with a speech recording facility advantageously gives the user the opportunity to customise the radio communications transceiver 10 to his specific requirements.

One example of use of this invention is in the case of a mobile radio user wishing to adjust the volume control of a mobile radio transceiver 10 whilst driving into a noisy environment. The user maintains total concentration on driving the vehicle whilst activating buttons (input elements 22) on the mobile radio unit's front panel 20. The controller 18 outputs synthesised speech through the speaker 28 corresponding to the buttons 22 activated, for example, channel selections, talk group details etc. until the desired volume button 22 is located. On being informed that the volume control had been chosen, further activations of the button 22 could be used to set the level of volume control, either increasing or decreasing the existing volume or activating the button 22 a number of times to set the volume to a particular level. These further activations may be in response to further synthesised speech samples provided by the mobile radio unit. Total control of the settings and operation of the mobile radio transceiver 10 is therefore achieved without the need for the user to look at the equipment.

The invention is not limited to radio communications transceivers, nor even to vehicle controls generally. An example of an application for telephony is in the field of banking enquiry services. The telephone (whether mobile or fixed) provides synthesised speech information describing the telephone numbers stored in its memory. The user telephones the bank, using such a memory button, and is informed of the services and facilities available. The user then reacts to the information provided and presses one or more digits on the telephone keypad for the service(s) desired. On each pressing of a digit, the mobile

telephone unit informs the user which digit has been pressed before the user decides to apply further or sustained pressure on the button to activate the desired digit. This arrangement has advantages in confirmation to the user as to the data being entered. Again, if the telephone is a mobile telephone, this does not require the driver to lose concentration on his primary task of driving the vehicle.

A further example of an application for the invention would be for any electronic unit provided for the blind, such as a washing machine or a computer. The assistance provided by this invention in the operation of such electronic equipment would be very beneficial.

Claims

1. Electronic equipment comprising:

a plurality of user-actuable input elements;

functional circuitry operably coupled to the input elements for control by a user; and

a speech generator coupled to the input elements for generation, in response to activation of each of the input elements, speech indicative of the function of that input element and

an audio output element for enunciating the speech to the user.

2. Electronic equipment according to claim 1 wherein the plurality of user-actuable input elements comprises at least one two-stage input element operably coupled to the speech generator and to the functional circuitry, for causing the speech generator to generate speech in response to a first stage of actuation and for controlling the functional circuitry in response to a second stage of actuation.

3. Electronic equipment according to claim 1 or 2, further comprising an audio input element and speech storing means coupled to the audio input element, wherein the equipment is operable in a speech storing mode and a functional mode and

in the speech storing mode, the equipment is arranged to receive speech and store the speech together with an association with one of the input elements and

in the functional mode the speech generator is arranged to recall stored speech from the speech storing means in response to activation of one of the input elements and enunciate the speech to the user.

4. Electronic equipment according to any one of claims 1 to 3 further comprising a storage element for storing speech samples, wherein the functional circuitry includes communications circuitry coupled to the speech generator for generating speech from speech samples communicated through the communications circuitry and the speech generator is coupled to the storage element for retrieving speech samples from the storage element and generating speech therefrom in response to activation of the input elements.

5. Electronic equipment according to any one of claims 1 to 4, further comprising a timing function operatively coupled to at least one of the input elements and to the speech generator for timing sequential actuations of at least one of the input elements such that sequential operation within a time-out period causes control of the functional circuitry without generation of speech by the speech generator.

6. Electronic equipment comprising:

at least first and second user-actuable two-stage input elements;

functional circuitry operably coupled to the input elements for control of at least first and second functions by a user;

a speech generator coupled to the input elements for generation, in response to a first stage of activation of the first input element, speech indicative of the first function and in response to a first stage of activation of the second input element speech indicative of the second function;

an audio output element for enunciating the speech to the user; and

a controller for controlling the first function in response to a second stage of activation of the first input element and for controlling the second function in response to a second stage of activation of the second element.

7. Electronic equipment according to claim 6, wherein the equipment is mobile radio equipment.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
GB 9423931.6

Relevant Technical Fields

(i) UK Cl (Ed.N) G3N (NG1A1, NG1A2) H3Q (QLCX)

(ii) Int Cl (Ed.6) H03J (1/02)

Search Examiner
MR D A SIMPSON

Date of completion of Search
25 JANUARY 1995

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant following a search in respect of Claims :-
1 TO 7

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	EP 0031589 A2	(MATSUSHITA) page 3	1, 2 and 6
X	US 4393277	(SELECTASTATION) column 2 lines 59 to 67	1, 2 and 6
X	US 4392246	(TOKYO SHIBAURA DENKI) column 4 lines 4 to 28	1, 2 and 6

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).