

The invention relates to a method for the use of a rotary operated continuous encoder for digital pulses according to the preamble of claim 1.

Encoders of this type are known in the digital art as digital-encoders. They consist of a rotatable disc, which can be scanned mechanically by sliding contacts, optically by opto-electronic sensors, or magnetically based upon the Hall-effect or else inductively. Thereby, the disc is moved past the pulse-generating element such as a wiper, a photo diode, a Hall-element or a coil. There are two sensors which are arranged displaced by a specific angle. The direction of rotation of the pulse encoder can be concluded from the phase-shifted pulse trains delivered by the latter so that, for instance, a counter connected thereto counts up or down, from which the result of the count can be evaluated digitally or, after conversion, in an analogue manner. Pulse encoders and methods of use of the kind hereinbefore described are in wide use in the digital electronics field and are also gaining more and more importance in the field of consumer electronics. An example of this is the pulse encoder described in DE-A-2 822 672. Different mechanical torques, which are switchable in dependence on the function, for an encoder of this type are described in a still unpublished patent application DE-OS 37 31 784.9. The pulse encoder is usually utilised several times, in that it sequentially controls different functions according to the operating commands of the user of the device.

Thus for example, it is possible to vary the station-tuning, the volume level, the bass- and treble-adjustment and the audio balance of the equipment by means of this single pulse-encoder. This is achieved in that these different functions are assigned to the pulse encoder by means of preselection keys.

The object of the present invention was to avoid the various said preselection keys and thus to achieve a simplified operation for microcomputer controlled equipment, which offers an advantageous, well-arranged single-handed method of operation.

This is achieved according to the invention by a method for the use of a rotary encoder and for its construction in accordance with the first two claims. Further developments and details can be gathered from the appendant claims and the drawing. The combination, of components that can be adjusted by rotation and an axially operated switch, is itself known. Thus, the combination of a potentiometer and an axially operated switch is described in the EP-A-0 157 373.

The solution according to the invention allows, by means of a method of use, a push- or pull- actuated switch, which is coupled to the rotary encoder, to be utilised such that the addressing of the rotary encoder is initiated by a switching-signal of the latter and that the adjustment function is selected by means of the rotary encoder actuator. The selection is subsequently acknowledged by means of a switching-signal of the switch. Thereafter, the adjustment can be made or a sub-function can be switched-to by means of the rotary encoder. A new switching command causes the selected function to be left, a possible further cyclic switching and/or the final storage of the adjustment. The addressing of the rotary encoder as well as the selection of the adjustment function by pulling or pushing the operating knob of the rotary encoder is preferably identified by labelled fields around this knob, which, upon selection, are for example illuminated from behind, and possibly also by means of a simultaneous acoustic signal. This can be effected by light emitting diodes or by means of other appropriate display elements.

An embodiment of the invention is illustrated in the drawing. Therein

Figure 1 shows in simplified form, a side-view of a rotary encoder coupled to a push-switch;

Figure 2 the arrangement of display fields around the operating knob of the rotary encoder;

Figures 3A and 3B a schematic diagram of the method of use for a rotary encoder having a push /pull switch, whereby both parts of the diagram 3A cooperate with each other at (A) and (B), in that the program-section 2 of Figure 3A and Figure 3B is reproduced in detail.

As can be seen from Figure 1, a rotary encoder 1 is mounted on a wall of a housing 4 (front of the equipment). An operating knob 2 is attached to its rotary shaft 3 and engages against the compression spring 5. The rotary shaft 3 is axially movable in the rotary encoder 1 in order to actuate a push-switch 6 having the contacts 7 and 8, which have the terminals 9. The rotary encoder has several outputs, the terminal 10 is shown.

Figure 2 shows the radially arranged display fields around the central rotatable encoder operating knob, which fields, after addressing and acknowledgement, are separately and selectively illuminated from behind by not shown light sources e.g. light

emitting diodes. The meaning of the display fields labelling is as follows:

Record Level
Record Balance
Pro.Nr.
Skip ID
START ID
Phones Level
Display Mode
Input Select

Figure 3 is intended to clarify the manner of operation of the method of use. Figure 3A shows a microcomputer μC having the program sections 1, 2 and n. The program section 1 serves for communication. In the program section 2, the switching signals from the push or pull switch and the pulse trains from the rotary encoder are entered at the terminal "Input". Its "output" controls the volume level in the mode shown. Moreover, there is an output of the microcomputer for "output-display".

Figure 3B shows the program section 2 between the terminals (A) and (B) in detail. The operations of the rotary encoder and the push or pull switch are indicated at the right of the symbolic block diagram, which shows the flow of the method of use in the sequence from top to bottom.

At the starting point, the first switch signal addresses the rotary encoder. Pulse trains from the rotary encoder cause the adjustment of a function, here, the "volume level". The looped back arrow connection is intended to indicate the cyclic nature of the adjustment, i.e. after "others" again back to "volume". After the adjustment of the function, a new switching signal initiates the acknowledgement of receipt of the function selected. This can result in the lighting of a display field for example. Renewed rotation of the rotary encoder caused the wanted value setting of the function or a sub-function by means of the transmitted pulse train. Due to the switching signal, a subsequent activation of the switch can, depending on the programming, cause the program section 2 to be left and/or a final storage (in the sense of an execution of the adjustment).

Other advantageous developments (programming) are not excluded by the described exemplary method for the use of the rotary encoder combined with a switch. A multitude of advantageous embodiments of the method of use are conceivable within the scope of the invention.

Claims

1. Method for the use of a rotary operated continuous encoder for digital pulses in a consumer electronics device, which, in operation, generates one of two pulse trains which are phase-shifted relative to each other in dependence on the direction of rotation, which trains enable the direction of rotation to be identified by means of electronic circuitry co-operating with a microcomputer, characterised in that, the rotational movement of the rotary encoder is used for selecting functions as well as for the adjustment of the function and a switch coupled to the rotary encoder assigns to the rotary encoder the functions selection, or functions adjustment, as well as receipt and/or storage processes, i.e. calls for the execution of the adjustment, by supplying switching signals in a pre-arranged sequence.
2. Method for the use of a continuous encoder according to claim 1, characterised in that, the switch coupled to the rotary encoder is constructed as a push- and/or pull actuatable switch.
3. Method for the use of a continuous encoder according to claim 1, characterised in that, for each function that has just been selected, a corresponding indication of receipt of an optical and/or acoustical kind is effected by means provided therefor.
4. Method for the use of a continuous encoder according to claim 1, characterised in that, the displays consist of light emitting diodes in or on a labelled field surrounding the operating knob for the encoder.
5. Method for the use of a continuous encoder according to claim 1, characterised in that, the displays are formed as labelled surfaces which can be selectively made visible by light means from below.
6. Method for the use of a continuous encoder according to claim 1, characterised in that, the displays consist of display elements which identify the selected main function in written form.
7. Method for the use of a continuous encoder according to claim 1, characterised in that, the switch coupled to the rotary encoder initiates the storage of the adjustment with each new actuation after rotational adjustment of the function is finished and cancels the function selection.



8. Method for the use of a continuous encoder according to claim 1, characterised in that, after the adjustment of the rotatable encoder is finished, a renewed actuation of the switch coupled to the rotary encoder causes a storage of the value of the adjustment for the selected function and/or the further switching to the following function.

9. Method for the use of a continuous encoder according to claim 1, characterised in that, the storage of an adjusted value at the rotatable encoder for a function and/or the cancellation or further switching of the function is effected automatically after a programmed time.

10. Rotary operated continuous encoder for use in a method according to claim 1, characterised in that, the encoder is equipped with at least one push and/or pull switch on the rotary shaft and/or the housing whereby the switching function is effected by axial and/or radial actuation of the rotary shaft and/or the housing of the encoder.

