SCREEN HAVING A TOUCH-SENSITIVE USER INTERFACE FOR COMMAND INPUT

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to the German application No. 10340188.1, filed Sep. 1, 2003 and which is incorporated by reference herein in its entirety.

FIELD OF INVENTION

[0002] The invention relates to a screen having a touch-sensitive user interface for command input through localized touching of the user interface and generation of a command signal when the touch is sufficient.

BACKGROUND OF INVENTION

[0003] Such screens, which are also often referred to as "touch screens," are sufficiently well known and are used wherever the user communicates interactively with the data processing device assigned to the screen, irrespective of type. In order to make an input that leads to a reaction on the part of the assigned data processing device, irrespective of type, or to the provision of information, and which is generally referred to below as a "command input", the user simply touches the user interface in the corresponding, optionally optically enhanced position. The touch is detected by a detection means assigned to the user interface and when the touch is sufficient, a corresponding command signal resulting from the command input is produced and supplied to the data processing device. If the touch has been sufficient to input a command, that is, if a command signal has been generated, then an optical acknowledgement is usually made via the screen. For instance, the display on the screen changes or the region that has been touched, which has shown an input key or suchlike for example, is shown in a different color, etc.

SUMMARY OF INVENTION

[0004] The before mentioned known touch screens include some disadvantages. Firstly, the optical acknowledgement is often not clear, and it is hard to see, which is the case in particular with screens with liquid crystal displays against a somewhat lighter background or an oblique angle of vision. This causes problems in particular for users who have fairly poor or poor sight. Moreover, the user has to direct his attention to the screen at the very moment that the acknowledgement is given to him. However, this is frequently not possible in cases where the control of a device or a unit is achieved via the touch-sensitive screen, since many working processes that have to be controlled require the screen to be operated "blind" whilst the resulting action is observed at the same time. Examples of this that could be mentioned are, for instance, operating a medical unit such as an x-ray machine in which the x-ray tubes and the x-ray monitor, for example, have to be moved into a certain position, for which procedure a joystick is used in the prior art. The operator watches the movement of the components being actuated but does not look at the joystick that he is activating. The use of a touch-sensitive screen is not possible in such cases.

[0005] Furthermore, it is not usually possible for severely visually impaired or blind people to work on a touch-sensitive screen since the information displayed is per se communicated to the user optically and in successful cases the acknowledgement is only given optically.

[0006] It is therefore an object of the invention to provide a screen which gives the user a perceptible acknowledgement about a successful command input even when the screen is not being or cannot be looked at.

[0007] This object is achieved by the claims.

[0008] The invention makes provision for the integration of means for the generation of a haptically perceptible signal, which means generate such a signal when the touch has been sufficient to generate a corresponding command signal. The haptic signal is generated at the position touched, this being virtually simultaneous with the generation of the command signal such that it is ensured that the point on the user interface is still being touched. The said touch can be effected directly by the user, with the finger for example, but also indirectly, using an input pen that the user holds in his hand. In each case the user receives a haptically perceptible acknowledgement relating to the successful input of the command, which acknowledgement he perceives in cases of direct contact via his extremely touch-sensitive finger, and in cases of indirect contact, via the input pen or such like, which is intrinsically rigid and stiff and which does not absorb the haptic signal but rather transmits it further.

[0009] This enables the user to receive a perceptible acknowledgement signal in each case, irrespective of whether he is currently looking at the screen or not. As a result of the fact that the haptically perceptible signal is generated as a direct function of the generation of a signal generated by touch, it is likewise ensured that a haptically perceptible signal is produced in fact only when an actual signal generation and consequent command input have taken place, such that the possibility of misinformation is ruled out.

[0010] As a means for generating the haptically perceptible signal, a piezoelectric layer assigned to the user interface is provided, which layer is locally actuatable in the manner of a matrix. The piezoelectric layer can be electrically actuated locally, which results in the layer undergoing a three-dimensional deformation, which deformation is the point of departure for the haptically perceptible information that is to be provided to the user. The piezoelectric layer can be arranged above or below the user interface, the only important thing being that the piezoelectric layer does not influence the optical display of the relevant information on the screen surface or only does so to an insignificant extent. Normally an LCD-screen has an outer layer covering the liquid crystal matrix, on top of which the touch-sensitive plane is applied in a transparent form in cases where the screen is a touch screen. The design is similar in the case of other screens, e.g. a cathode ray monitor, an LED screen, a vacuum fluorescence screen, or a plasma or TV/video screen, on the screen surfaces whereof the touch-sensitive plane is applied. The design of a touch screen is sufficiently known and does not need to be explained in further detail. Now it is conceivable for the piezoelectric layer to be applied under this plane in a thin form that is inevitably transparent, together with control circuits that are likewise transparent, such that the information that can be provided haptically thereby is supplied direct to the touch-sensitive surface that has been actuated by the finger or pen or such