

screen **301**. The display screen **301** has to be a flexible display, capable of bending around the relief generated by the relief generator **302**. The relief generator **302** need not be transparent in this case, so it may for example be built from opaque piezo-electrical material or electromechanical parts driving pins against the rear of the display screen **301** to cause the relief.

[0024] FIG. 4 schematically shows a display screen comprising a relief generator with tactile feedback capability. It depicts the same situation as FIG. 2, but now button **104** is depressed by the user's finger **401**. Initially, when the user's finger **401** just lightly touches the button **104**, the protrusion is maintained. Only when the force exerted by the user's finger exceeds a certain threshold, the protrusion is cancelled or even converted into a depression, giving a 'snap' feeling indicating to the user that the button is actually pressed. For that purpose the relief generator and the interactive application generating the graphical button should be able to communicate this exceeding of the threshold. The application will only cancel the current operation if the button **104** is actually actuated, i.e. when the exerted force exceeds the predetermined threshold. As described above, the piezo electrical layer can be additionally used as a touch sensitive layer. The initial touching of the user's finger **401** causes a depression of the button **104** which in turn causes a small voltage generated by the piezo electrical material. This voltage is opposite to the voltage applied to the button for generating the protrusion. This latter voltage may be maintained or even increased temporarily for generating a resistance, and suddenly lowered, removed or even inverted when the exerted force exceeds the predetermined threshold. This causes a snap action which resembles the feeling of operating a hardware push-button.

[0025] In an advanced embodiment a toggle push button (typically an on/off button) may be simulated by controlling a graphical button, after release by the user's finger, to remain in a lower position (representing an 'on' state) or return to an upper position (representing an 'off' state). The lower position may be lower than or equal to a neutral level, while the upper position may be equal to or higher than the neutral level. These different levels may be accomplished by supplying various voltage levels, either all positive, or both positive and negative voltages. For example, an intermediate positive voltage may be used for generating the neutral level, while a zero voltage may be used for generating a depression. Alternatively, the neutral level may correspond to a zero voltage, while a depression corresponds to a negative voltage.

[0026] FIG. 5 schematically shows another display screen comprising a relief generator with tactile feedback capability. It depicts a user's finger **401** pushing a slider button **501** along a slider control **502**. The slider control **502** is represented by an oblong depressed area, wherein the slider button **501** is represented by a protrusion at the appropriate position along the slider control. Just pressing the slider button **501** in a direction perpendicular to the display screen **201** does not have any effect, at least not a change of the variable to be adjusted with the slider control. It could, for example, be interpreted as a confirmation of an adjustment. The actual adjustment is achieved by detecting a touch of the user's finger **401** on both the slider button **501** and the slider control **502**. This is interpreted by the system as the desire to push the slider button **501** in the opposite direction, i.e. to

the left in FIG. 5. The relief generator **202** reacts by relocating the protrusion corresponding to the slider button **501** to the left by a predetermined distance, which could be further dependent on the force exerted. Subsequently, the user may remove his finger to stop adjusting the slider button, or follow the movement of the protrusion by shifting his finger to the left as well. Eventually, if the slider button reaches the end of the slider control, the relief generator **202** may communicate this to the user by not moving the protrusion any further, so maintaining the protrusion at the current position. The user can move the slider button **501** back again by placing his finger **401** on the other side of the button **501** and simultaneously at the end of the slider control **502** or the 'neutral' area beyond it. In an advanced embodiment the relief generator **202** is capable of detecting a component of the force exerted by the user which is not perpendicular to the display screen **201**. In that case there is no need for the user to simultaneously touch the slider button **501** and part of the slider control **502**, so the user can push the slider button **501** by just pressing against it in a direction not perpendicular to the display screen **201**.

[0027] In summary, the invention relates to a display system which comprises a display screen for displaying a graphical representation. The surface of the display screen has relief in order to provide tactile and/or visual guidance to the user. The display system according to the invention comprises a relief generator for dynamically generating the relief on the display screen. It is thus achieved that the relief can be changed dynamically in accordance with the graphical output of the current application.

[0028] Although the invention has been described with reference to particular illustrative embodiments, variants and modifications are possible within the scope of the inventive concept. Thus, for example, the relief generator may be applied in a device without any support for touch control, so just for visual and/or tactile guidance. Alternatively, a separate touch sensitive layer may be applied, dedicated to the touch detection function, while the relief generator is dedicated to the generation of relief.

[0029] The word 'comprising' does not exclude the presence of elements or steps other than those listed in a claim. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The invention can be implemented by means of hardware comprising several distinct elements, and by means of a suitably programmed computer. In the device claim enumerating several means, several of these means can be embodied by one and the same item of hardware.

1. A display system (**100**) comprising a display screen (**101**) for displaying a graphical representation, the display screen providing tactile and/or visual guidance to the user by means of relief, wherein the display system comprises a relief generator (**202, 302**) for dynamically generating the relief on the display screen.
2. A display system as claimed in claim 1, wherein the relief generator (**202, 302**) comprises piezo electrical material to provide said relief in response to electrical signals.
3. A display system as claimed in claim 1, further arranged to detect user actuations from electrical signals received from the relief generator (**202, 302**).