BRAILLE DISPLAY ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority to Provisional Patent Application No. 60/481,979 filed, Jan. 30, 2004.

BACKGROUND OF INVENTION

A Braille display is an electromechanical device that connects to a computer by way of a serial or parallel cable. The display consists of a line of electromechanical tactile cells, each with six or eight pins that move up and down to represent the dots of a Braille cell. The display is used to represent a line of text on a computer screen. Each cell has six or eight tactile pins that are driven by electromechanical or piezoelectric effects. The user of the display is able to read a line of Braille cells by touching the pins of each cell as they are extended above a tactile surface. After a line has been read the user can refresh the display to allow for additional lines to be presented and read. Braille displays are often combined with other hardware and software to make up an integrated unit. For instance Braille displays are connected to video monitors to serve as the display unit, and many units incorporate speech output of the screen prompts.

Electromechanical tactile cells for use in refreshable Braille displays and graphical tactile displays are known in the art. An exemplary tactile cell as known in the art consists of eight piezoelectric reed elements corresponding to eight tactile pins. The necessary electrical connections and driving forces are provided to actuate the reeds, thereby causing the tactile pins to protrude above a tactile surface to allow the Braille character or graphic element to be displayed.

The design of the Braille cell display requires that many individual Braille cells be positioned adjacent to each other to form a tactile display for a line of text. The positioning of the Braille cells is critical to the effectiveness of the display. Due to the increased tactile sensitivity of the user, the placement of the tactile pins, and therefore the Braille cells, must be very precise. Many problems are caused by the dimensional tolerances of the individual Braille cells. Manufacturing the Braille cells with exact precision is not possible as variances in the dimensions arise.

Prior art Braille cell assemblies establish positioning of the cells reliant upon the contact of the individual Braille cells with the adjacent cells. According to previous Braille display assemblies as known in the art, the assembly is made by threading a plurality of Braille cells together on one or more rigid support rods. The rods are passed through holes in the frames of the Braille cells. With this construction methodology, the positioning of the Braille cells within the assembly is dependent upon the contact between the adjacent cells. As such, the individual deviations in the dimensional tolerances in each Braille cell will be manifested in the Braille display assembly. These deviations can result in a Braille display assembly with significant deviation from a desired dimensional specification. To alleviate some of the problems associated with this common method, the individual Braille cells are compressed together and the edges of the individual Braille cells are physically modified to meet a desired dimension, resulting in a very labor intensive solution. The positioning problems associated with this method are compounded in larger Braille displays. The larger Braille displays employing a large number of Braille cells require an even longer support rod. The increased length of the rod is often

responsible for buckling during packaging and transportation, thereby requiring additional adjustment of the assembly.

In addition to the dimensional requirements of the Braille display assembly, it is also necessary to maintain the individual Braille cells in strict alignment to meet the sensitive tactile requirements of the user. If the Braille cells tactile pins are misaligned, the user may have difficulty reading the display. The support rod assembly, previously described as known in the art, does not provide precise alignment of the Braille cell tactile pins.

Prior art systems have been presented to provide a Braille display assembly which has and maintains precision cell positioning. Such Braille display assemblies include a holder capable of rigidly maintaining the individual cells in predetermined positions adjacent one another. While these prior art systems help to alleviate the problems associated with the dimensional specifications of the display, they do not provide a means for reliably aligning and maintaining the alignment of the Braille cell tactile pins.

Prior art Braille displays employ one individual tactile pin cap per individual Braille cell. The tactile pin cap serves to position and align the pins of the individual Braille cell and provides the cursor control buttons. The Braille cells and associated tactile pins caps are positioned adjacent to each other to establish the tactile surface. The use of individual cell caps for each Braille cell increases the manufacturing cost and the cost of materials. Braille readers are sensitive to the separation that is inherent with the use of individual Braille caps. This unevenness between each cell plagues all Braille displays known in the prior art. To tactile users, the tactility of the grooves and cell-to-cell unevenness is comparative to the noise or flicker on a computer monitor experienced by a visual user. As such, minimal spacing between the Braille cells is required to provide an acceptable tactile feel for the reader. Even with the closest fit possible with the prior art methods, the separation ridge between the Braille caps is identifiable to a Braille reader.

Additionally, maintenance and replacement of the individual tactile pins is often necessary. Contaminants that build up on the pins must be removed or the pins must be replaced upon excessive wear. With the prior art Braille display assemblies, removing an individual tactile pin cap for maintenance purposes requires that the securing stabilizers also be removed, thereby altering the alignment of all the individual caps which must then be realigned after the pins are replaced. A similar procedure must be followed to replace a defective Braille cell assembly.

Accordingly, there is a need in the art for an improved Braille display assembly. Improvements in manufacturability and repair are necessary in addition to enhancements in the tactile experience of the user. There is a need for an improved alignment mechanism and procedure for the individual Braille cells comprising the display that enhances the user interface and allows for easy maintenance of the tactile pins and individual Braille cells.

However, in view of the prior art considered as a whole at the time the present invention was made, it was not obvious to those of ordinary skill in this field that the identified improvements should be made nor would it have been obvious as to how to make the improvements if the need for such improvements had been perceived.

SUMMARY OF INVENTION

The longstanding but heretofore unfulfilled need for an improved Braille display assembly is now met by a new, useful, and non-obvious invention. The Braille display