BRAILLE CELL CAP

CROSS REFERENCES TO RELATED APPLICATIONS

[0001] This application is a continuation of co-pending U.S. patent application Ser. No. 10/711,427, filed Sep. 17, 2004; Application Ser. No. 60/481,979 filed Jan. 30, 2004 entitled Braille Cell Cap, the contents of both applications are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] This invention relates, generally, to Braille readers. More particularly, it relates to a Braille reader that captures information displayed on a computer screen and transforms the information into Braille.

BACKGROUND OF THE INVENTION

Description of the Background

[0003] Electronic devices that capture written information on a computer screen and transform the information into Braille are known. The known devices incorporate Braille cells that may include a plurality of hollow housings of parallelepiped construction, each of which houses either six (6) or eight (8) Braille pins. In the alternative, the housings may be solid and provided with bores for receiving the Braille pins. The pins are arranged in two (2) columns of three (3) or four (4) pins each.

[0004] When in repose, each pin is fully positioned within the hollow interior of its housing) or its bore. One of the walls of the housing has six (6) or eight (8) openings formed therein through which the uppermost tips of the pins selectively extend when activated.

[0005] The pins are selectively extended by actuator means to represent Braille characters. For example, when the letter "A" is detected on a computer screen, an electrical signal is sent to an actuator and the combination of pins that represents that letter in Braille is activated so that the combination of pins representing that letter are actuated so that they physically extend outwardly of tie housing so that they can be felt by a person reading Braille.

[0006] A bimorph reed, sometimes simply called a bimorph or a bimorph actuator, has s common center conductor sandwiched between two piezoceramic transducers. Series polled bimorph reeds are in common use in Braille cell actuators. Prior art Braille cell actuators incorporate series x-polled bimorph reed technology whereby the top and bottom elements are not electrically isolated from one another. The common center point is grounded and a high voltage is applied to one of the outer strips. A simple circuit drives the center conductor and fixes the outer conductor. This arrangement drives only one piezo element and the opposing element performs as a mechanical drag. Hence a bend is formed in the bimorph reed due to the difference in voltage-dependent expansion rates of the two parts of the bimorph reed, just as a bend is formed due to the difference in temperature-dependent expansion rates of the two parts of a bimetallic strip of the type commonly found in analog thermostats

[0007] A special metallic plating is applied to the outer piezo-ceramic contacts to enable soldering of the leads to a printed circuit board (PCB). The need for such special metallic plating increases the manufacturing costs associated with each bimorph reed.

[0008] Accordingly, there is a need for an improved bimorph reed construction that does not require such special metallic platting.

[0009] Sixteen (16) hand-soldered wires requiring thirty-two (32) solder joints are necessary to establish the electrical connections.

[0010] Thus there is a need for an improved means for connecting the leads to the PCB. Tie improved means would reduce the number of solder joints required and thus lower the manufacturing costs while increasing the reliability of the Braille cell.

[0011] Prior art Braille cells employ one individual cap per individual Braille cell. This results in a reading surface that is rough because it includes grooves, gaps and steps between the individual caps. The individual tolerances of each Braille cell results in a gap between the Braille cells and their surrounding enclosure. Moreover, the assembly of each Braille cell cap drives up the cost of manufacturing.

[0012] More particularly, prior art Braille cells employ one individual tactile pin cap per individual Braille cell. The tactile pin cap serves to position and align the pins and further provides cursor control buttons. The Braille cells and associated tactile pin caps positioned adjacent to each other collectively form the tactile surface. The use of individual cell caps for each Braille cell increases the manufacturing cost as aforesaid as well as the cost of materials. Additional stabilizers are required to position and align the individual cell caps. Strict tolerances are required to provide an acceptable tactile feel for the reader. The reader is sensitive to the separation that is inherent between each cell with this design. This unevenness between each cell is a limitation of all Braille displays heretofore known. To tactile users, the tactility of the grooves and cell-to-cell unevenness is comparable to the noise or flicker on a computer monitor experienced by a sighted user. 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.

[0013] Accordingly, there is a need in the art for an improved electromechanical tactile cell for use in a refreshable Braille display. Improvements in manufacturability and reparability are necessary in addition to enhancements in the tactile experience of the user.

[0014] The time required to manufacture a plurality of caps, each of which must be within certain tolerance limits, and to individually cap each Braille cell drives up the cost of manufacturing. Prior art cell caps produce a gap between the Braille module and the opening in the Braille display case. Each gap is a result of the accumulation of dimensional tolerances on a per cell basis. The art teaches use of an extra frame to correctly space each cell at a centerline. This approach is unsatisfactory because it further accentuates the unevenness of the display and provides additional area for contaminates.

[0015] It would therefore be advantageous if a better way could be found to cover the Braille cells.

[0016] The mounting of bimorph reeds has also been a source of problems. Some Braille cell assemblies employ adhesives to adhere the bimorph reeds to a printed circuit board. Some use clamps which themselves must be adhered or otherwise attached to a suitable mounting surface.

[0017] Thus there is also a need for an improved means for mounting a bimorph reed to a Braille cell assembly.

[0018] However, in view of the prior art considered as a whole at the time the present indention was made, it was not