ELECTROMECHANICAL BRAILLE CELL AND METHOD OF OPERATING SAME

BACKGROUND OF THE INVENTION

The present invention relates in general to electromechanical braille cells and, more particularly, to an improved method of operating same.

DESCRIPTION OF THE PRIOR ART

Heretofore, electromechanical braille cells have utilized six piezoelectric reeds which bend in response to the application of an electric voltage thereacross for urging the tip of sensing rods through an array of six openings in a braille cell reading surface. The protruding tips of the sensing rods are sensed by the finger of the operator to define a braille character. One such prior art arrangement is disclosed in U.S. Pat. No. 4,283,178 issued Aug. 11, 1981 and assigned to the same assignee as the present invention.

One of the problems with the standard braille cell and code is that with only six rods it was not possible to include the English alphabet and also indicate other information such as upper and lower case with a single setting of the six rods. Upper case was indicated by using two cells. The first cell was set to indicate the case.

Others have proposed to add two additional rods to the standard six rod cell for indicating upper and lower case and other information. However, this adds substantial complexity to the standard six rod electromechanical braille cell.

It would be desirable if additional information, such as case, could be imparted to the reader by a single setting of the standard six rod electromechanical braille cell.

SUMMARY OF THE PRESENT INVENTION

The principal object of the present invention is the provision of an improved six rod electromechanical braille cell and method of operating same so as to give additional information to the reader.

In one feature of the present invention, additional information, such as upper or lower case, for a single setting (character) of the standard six element braille cell is imparted to the reader by vibrating one or more of the six elements (rods) of the braille cell, whereby the standard six element braille cell may be used without having to add additional elements to the cell.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of a standard, prior art, six element electromechanical braille cell,

FIG. **2** is an enlarged plan view of a portion of the structure of FIG. **1** taken along line **2—2** in the direction of the arrows,

FIG. **3** is an enlarged sectional view of a portion of the structure of FIG. **1** taken along line **3—3** in the direction of the arrows,

FIG. **4** is an enlarged cross sectional view of one of the piezoelectric reeds of FIG. **1** taken along line **4—4** in the direction of the arrows, and schematically depicting the electrical circuitry for applying the operating potential to the respective reed,

FIG. **5** is an enlarged exploded view of one of the sensing rods of FIG. **1**, and

FIG. **6** is a plan view of a plurality of the braille cells of FIG. **1** arranged for display of two lines of braille text.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. **1** and **2**, there is shown a prior art standard electromechanical braille cell **11**. The braille cell **11** includes a vertical base plate **12** as of ABS plastic material formed by injection molding and having upper and lower horizontal flange portions **13** and **14** with a recessed central web portion **15** extending vertically therebetween. The web portion **15** is notched from the inside edge to provide six generally rectangular openings **16** to receive the root portions of six piezoelectric reeds **17**. The piezoelectric reeds are captured in an interference fit at a restricted neck portion **18** at the entrance to each of the rectangular openings **16**. The neck portions **18** define fulcrum points about which the piezoelectric reeds **17** bend in response to an applied operating voltage. A top plate **19** is secured to the base plate **12** via the intermediary of screws, not shown. The top plate **19** is recessed at **21** and **39** to receive stringers, not shown, for mounting the individual braille cells **11** transversely of the stringers.

A sensing plate portion **22** of the top plate **19** includes an upper sensing surface **23** which is apertured by means of six vertically directed bores **24** which slideably receive therewithin a narrow neck portion **25** of a sensing rod **26**. The upper end of the sensing rod **26** is rounded. That portion of the rod which protrudes above the surface **23** is sensed by the finger of the operator to determine the pattern being displayed on the individual braille cell **11**.

The lower extremity of the sensing rod **26** (see FIG. **5**) is counterbored at **27** to slideably receive therewithin in a telescoping manner a rod extender insert **28**. The insert **28** includes a dowel portion **29** which slides within the counterbore **27** in the main body of the rod **26**. The dowel portion makes a tight interference fit with the internal walls of the bore **27** so that by adjusting the degree of penetration of the dowel **29**, the axial length of the composite rod structure **26** is determined.

The sensing rods **26** rest at their lower extremity upon the free end portions of the respective piezoelectric reeds **17**. The reeds **17** are cantilevered about the fulcrum support **18** with the free end portions thereof supporting their respective sensing rods **26**. The reeds **17** are arranged in a stair step fashion in pairs. The uppermost reed of each pair is apertured to allow passage therethrough of the sensing rod resting upon the lowermost reed of each pair. The aperture is conveniently formed by a notch which notches out one of the corners of the respective reed. Such a notched corner is shown at **31** in FIG. **3**. The sensing rod **26** associated with the uppermost reed of each stair step pair rests upon the corner of the reed at the free end of the reed **17**. The sensing rods **26** associated with the successively lower pairs or steps of the stack of reeds **17** pass by the ends of the reeds above that pair in the stack of reeds **17**.

Referring now to FIG. **4**, the piezoelectric reeds **17** each comprise a sandwich structure of piezoelectric material in which two layers of electrically polarized piezoelectric material **32** and **33** sandwich therebetween a leaf of conductive material **34**, as of brass. The outer surfaces of the piezoelectric layers **32** and **33** are covered with a thin layer of electrically conductive material **35** as of gold or nickel. In a typical example, the