FIG. 7 is a further enlarged broken away and exploded view of a portion of the preferred embodiment, taken on a plane indicated by the line 7—7 in FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The following relatively detailed description is provided to satisfy the patent statutes. It will be appreciated by those skilled in the art that various changes and modifications that are not mentioned can be made without departing from the invention.

FIG. 1 illustrates a computer braille display device **11** incorporating a preferred embodiment of a braille assembly **12** of the invention, in combination with a standard computer. Such computer is made up of the typical computer enclosure **13**, a display monitor **14**, and an input/output keyboard **16**. As is illustrated, the keyboard is mounted on the braille display device just above the braille assembly. An operator's hands, represented in phantom at **17**, then can easily shift between braille input/output and the keyboard for operation, for example, of cursor control and function control keys.

The preferred embodiment of the braille cell assembly of the invention is illustrated in detail by the other figures (except for FIG. 3, which shows the prior art). The assembly is made up not only of individual braille cells as illustrated at **18**, but also a holder tray **19** for such cells. As can be seen best from FIG. 2, the longitudinal edges of the tray are upwardly bent to form spaced apart flanges **21** and **22**. Each of the braille cells is itself made up of a support frame **23** and a printed circuit board **24** having the circuitry needed by the individual cell to convert electrical signals into movement of its bimorph reeds **26** which, in turn, move braille sensor pins **27** inward and outward relative to a cap **28**. It is this movement of the sensor pins which is detected by the finger of an operator.

Each braille cell support frame **23** has a pair of slots **29** and **31** which are complementary to receive the flanges **21** and **22**, respectively. The spacing between the slots is the same as the spacing between the flanges so that both slots can engage their respective flanges simultaneously.

Flange **21** includes a plurality of notches **32** which are spaced apart along its length by the same distance it is desired the center planes of the cell support frames **23** also be spaced apart. As best illustrated in FIG. 7, each slot **29** includes a notch projection **33** which engages in an associated slot **32** when the cell is in an appropriate position. Moreover, a plurality of holes **34** are provided extending through flange **21**, respectively centered beneath associated notches **32**. As an important aspect of the assembly, each of the slots **29** further includes a projecting nub **35** which fits within an associated hole **34** when a cell is in an appropriate position.

Reception notches **36** are also provided in the other flange **22**, which reception notches register with corresponding notch projections **37** (FIG. 6) within each of the slots **31** as illustrated.

A strip motherboard represented at **38** is also provided adjacent the tray for reception of the printed circuit boards of the individual cells. It should be noted that while it is common to provide such a motherboard for the cells, in the past such boards have engaged the individual cells at the end of the cell circuit boards, rather than at the bottom.

It will be seen from the above that each of the cells is maintained individually by the tray in a set position orthogonal to the axis of such tray, which axis is represented in FIG. 2 by the reference numeral **40**. The positioning of each cell is not affected from the mechanical standpoint by the positioning of such cell's neighbors. This has several advantages. For one, it takes away the possibility that any deviation of a cell from a desired exact width dimension will affect the positioning of adjacent cells. For another, it makes it possible to remove an individual cell from the holder tray without disturbing the positioning of others. This removal can be accomplished by simply withdrawing a cell's projection **35** on its support frame from its registering hole on the tray flange **21**. This enables a cell to removed for repair or replacement without disturbing the positioning of any other cells—positioning is provided by the tray **19**, not by adjacent cells.

To facilitate removal of the individual cells from an assembly, it is preferable that the support frame **23** of the individual cells be made of a somewhat resilient plastic material. This will enable the slot **29** of a cell to be expanded to the extent necessary to free it from the support frame.

In some instances, it is desirable that several different assembly sections be provided, which assemblies are separated from one another. One tray can accommodate more than one of such sections, and it will be recognized that the tray will maintain the desired distances between such sections. FIG. 4 shows cells separated from one another, not only to emphasize the independence in positioning of the individual cells, but also to illustrate separation of different cell section(s).

It must also be remembered that the nub on the individual cells can simply be a detent which engages a corresponding indent (the hole may not extend all the way through) on the tray flange. Each of the individual cells may also include an alignment tab **41** if desired to facilitate alignment during assembly with the remainder of a computer braille display device.

As pointed out above, in the past braille cell assemblies have been made by threading long rods through registering holes in adjacent individual cells. FIG. 3 is a top view of a partial assembly formed in this manner. The rods are represented at **42** and the through holes in the individual cells through which such rods extend, are represented at **43** (FIG. 6). It will be seen that the positioning of every cell is dependent upon the positioning of the adjacent cells. Since each cell itself cannot, as a practical matter, be precisely dimensioned in its width direction (have no tolerance leeway at all), the dimension of an assembly along the assembly length (the individual cell width) as represented by dimensional arrow **44** is completely unpredictable. Because of such it has been the practice in an effort to circumvent this problem for the assembler to "squeeze" the cells by use of end brackets on the rods to achieve a desired dimension. (In some instances, the assembler has to file or sand the width of individual cells, or insert shims, to achieve such desired dimension.) The provision of a separate rigid holder for the individual cells assemblies alleviates this problem. It is the holder which defines the assembly dimensions in the direction **44**.

In this preferred embodiment in which the holder is a tray, it is the tray which maintains the individual cells in precise positions. The projecting nubs **35** are only slightly smaller than the holes **34** in the flange **21** within which they fit, with the result that there is very little movement of the cells relative to the tray. The tray itself is rigidly installed in the enclosure of the computer display system via holes **49** adjacent the tray ends. The use of the tray facilitates handling of the display and, in contrast to a situation in which