

## REFRESHABLE BRAILLE DISPLAY UNIT

## FIELD OF THE INVENTION

The present invention related to an apparatus for displaying and inputting Braille characters.

## BRIEF DESCRIPTION OF THE RELATED ART

Braille was developed to aid the blind to read alphanumeric characters. Braille consists of a six-unit code making up a cell, wherein each cell represents a character. The six-unit code is generally in the form of different combinations of raised bumps. The six-unit code permits a total of about sixty-four combinations, including twenty-six alphabet letters, numbers one through nine, as well as various symbols, including punctuation, indicators, and the like.

Conventional refreshable Braille display units often use piezo material actuation technology, which was introduced in the late 1970's. While the conventional units have proven to be reliable, they have certain drawbacks. For example, one drawback of the prior art units was that they may be very expensive to construct, and in addition, the software used to drive the display may be difficult to learn and may not always be user-friendly. Another drawback is that some prior units rely on gravity to lower a pin which is a problem if the user, due to a disability, requires that the display unit be used on an angle.

Generally, prior devices for displaying Braille characters have included mechanisms which raise and lower a physical point above and below a plane of reference, so that the position of the point, i.e. raised or lowered, can be detected and ascertained by the user's sense of touch. The mechanisms for producing the tactile displays of raised points have generally included cumbersome components, making them large in construction, cumbersome, and expensive to construct and operate. For example, U.S. Pat. No. 4,871,992 discloses the use of an electromagnet to pull a touch pin down from a reference surface. U.S. Pat. No. 5,453,012 discloses a rotary cam actuator to move pins between elevated and lowered positions. U.S. Pat. No. 5,766,014 discloses a binary information display apparatus which displays information by means of an array of a plurality of parallel pins where the pins engage with a rotary cam.

A need exists for a device which may display Braille characters which may be economically made, and which may be less cumbersome than the prior devices.

## SUMMARY OF THE INVENTION

The invention provides a refreshable computer Braille display unit, including a housing with a plurality of refreshable cells housed in the housing, where each cell may comprise a guide block having six holes, six motors, each with a coupler which may be rotated by the motor, and a pin fastened to each coupler and being adapted to selectively extend through one of the holes of the guide block, with a stop provided for limiting the rotation of each coupler to control the position of the pin extension.

The invention further provides a keyboard with a Braille display which can be operated from one of a plurality of character sets at different locations on the keyboard.

It is an object of the present invention to provide a novel apparatus for displaying Braille.

It is another object of the present invention to provide a novel apparatus for displaying Braille which is economical to produce.

It is another object of the present invention to provide a novel apparatus for displaying Braille which is generally compact, and not as cumbersome as prior devices.

It is another object of the present invention to provide a novel apparatus which facilitates the retention of the pins in their desired positions for displaying Braille characters.

It is another object of the present invention to provide a novel keyboard which may be oriented in at least two positions.

It is another object of the present invention to provide a novel keyboard which may be oriented so that a user may use a first set of keys or a second set of keys.

It is another object of the present invention to provide a novel keyboard which has a display for displaying Braille characters, and which has key sets disposed both above and below the display.

It is another object of the present invention to provide a keyboard having a display for displaying Braille characters, and which has a first key set disposed above the display and a second key set disposed below the display, and a computer controlled by software to recognize which key set is being used.

These and other advantages may be achieved with the present invention.

## BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is a perspective view of a refreshable display unit in accordance with the present invention.

FIG. 2 is an enlarged fragmentary view of the unit of FIG. 1 taken within the phantom circle of FIG. 1.

FIG. 3 is a sectional view taken through the guide block along the section line 3-3 of FIG. 2, and showing the pins and motors separate from the other components.

FIG. 4 is a side elevation view of a motor and coupler, illustrating the pin in its lowered position.

FIG. 5 is a side elevation view of a motor and coupler, illustrating the pin in a position between the raised and lowered position, as the pin is being moved from a lowered, FIG. 4 position, to a raised position.

FIG. 6 is a side elevation view of a motor and coupler, illustrating the pin in a raised position.

FIG. 7 is an alternate embodiment of a unit in accordance with the present invention, illustrating walls provided on opposite sides of a coupler having an alternate configuration.

FIG. 8 is a top plan view of an alternate embodiment in accordance with the present invention illustrating a keyboard having a first set of keys and a second set of keys.

## DETAILED DESCRIPTION THE PREFERRED EMBODIMENTS

Reference being made to FIG. 1, a refreshable display unit 10 constructed in accordance with the present invention is illustrated having a housing 11, and a display 12. A plurality of refreshable cells 13, 14, 15, 16, 17, 18, 19, 20, are housed within the housing 11 with the area 30 being generally represented by phantom lines, wherein a plurality of cells may be provided within that area 30. Input means for inputting a user's input is provided shown comprising a plurality of keys, 21, 22, 23, 24, 25, 26, each of which keys preferably corresponds to a Braille character set array where the six dots of the Braille cell are numbered 1 through 6, as illustrated in FIG. 2 showing the enlarged view of cell 15, as an example. The unit 10 is used by a user depressing a