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between the opposing ends of the character carriage over an outside surface of the membrane, as the character carriage moves over the base unit scanning from one end to the other to simulate a page of Braille characters.

A primary objective of the present invention is to provide an apparatus and method of use of such apparatus that provides advantages not taught by the prior art.

Another objective is to provide such an invention capable of being programmed to present Braille text so that a single surface may be read repetitively as pages in a Braille book.

A further objective is to provide such an invention capable of electromechanically positioning Braille beads against an underside of a flexible membrane in accordance with an appropriate Braille text.

A still further objective is to provide such an invention capable of positioning the beads using a rotating belt or in an alternate embodiment, with electromagnetic repulsion and attraction.

Other features and advantages of the present invention will become apparent from the following more detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate the present invention. In such drawings:

FIG. 1 is an exploded perspective view of the preferred embodiment of the invention;

FIG. 2 is a perspective view thereof in use;

FIG. 3 is a perspective view thereof showing a read unit of the invention;

FIGS. 4A, 4B and 4C are side elevational views thereof showing a first embodiment of the invention in operation;

FIGS. 5A, 5B and 5C are side elevational views thereof showing a second embodiment of the invention in operation.

DETAILED DESCRIPTION OF THE INVENTION

The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description.

The present invention is a Braille reading apparatus providing a base unit 10 (FIG. 1) presenting a planar upfacing surface 20 and a traveling Braille character carriage 30 which is adapted for moving or scanning from one end 22 of the surface 20 to the other end 24. A cover unit 40 (FIG. 1) is engaged with the base unit 10 as shown in FIG. 2. The cover unit provides a flexible membrane 42 extensive over the upfacing surface 20 and is positioned in parallel therewith. The character carriage 30 is engaged for scanning as shown by the arrows in FIG. 1, by a means for scanning 32 such as a pulley system or rack and gear drive as are well known in the art. Such a drive is mounted in the base unit 10 as shown in FIG. 1 and may, for instance, comprise a small stepping motor with a drive cable or wire for moving the character carriage 30 to selected positions on the surface 20 as will be further described below. The character carriage 30 provides plural character read units 50, one of which is shown in FIG. 3. These read units 50 are positioned in linear sequence between opposing ends 30', 30" of the character carriage 30. Each of the read units 50 has a means for character presentation 52 (further referred to as a Braille bead assemblies) which is positionable in contact with an

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underside 44 of the membrane 42. In this manner a "page" of Braille characters is readable through tactile contact moving between the opposing ends 30', 30" of the character carriage 30 over an outer surface of the membrane 20, i.e., the surface visible in FIGS. 1 and 2, as the character carriage 30 moves over the base unit 10 between ends 22, 24.

In the preferred embodiment, each of the read units 50 comprises six Braille bead assemblies 52. As shown in FIG. 3, these assemblies 52 are mounted on shafts 54 for rotation. Each of the Braille bead assemblies 52 provides a support block 55 and extending from the support block 55 a dome 57. The support block 55 is mounted on axle or shaft 54, as shown, and is therefore rotationally positionable between an up-dome position and a down-dome position, both of which are shown in FIG. 3, wherein the up-dome position places the dome 57 into abutting contact with the undersurface 44 of membrane 20, and the down-dome position places a flat surface 59 of the support block in adjacent juxtaposition to the membrane 20 but spaced away from membrane 20.

In one embodiment, shown in FIGS. 3-4C, a revolving belt 60 is positioned below the bead assemblies 52 and in near contact with them. This arrangement is adapted for moving the bead assemblies between the up-dome position (UDP) and the down-dome position (DDP) in accordance with an electro-magnetically operated release assembly 70. It should be noticed that the support block 55 provides a pair of tabs 56 extending outwardly from the block 55 on opposing sides thereof. When it is desired to move the bead assemblies from their current position to the alternate position, i.e., from UDP to DDP or from DDP to UDP, the release assembly 70 is actuated, by a solenoid actuator or similar device as is well known in the art, and therefore revolves, as shown by the arrow at the extreme left in FIG. 4B. This causes the block 55 to rotate, again as shown at the left in FIG. 4B and to be caught by moving belt 60 so as to be fully revolved to the alternate position. This sequence is fully illustrated at the left in FIGS. 4A, 4B and 4C where the bead assembly 52 is shown to move from the UDP to the DDP. The opposite movement is completed in like manner. In FIG. 4A it is shown that membrane 20 is pushed upwardly by each of the bead assemblies 52 which are rotated into the UDP. It would be within the skill of one routinely knowledgeable in the art to configure a circuit to enable the actuation of appropriate ones of the release assemblies 70 to configure each of the read units 50 in the sequence of such read units 50 on character carriage 30, to take on the form of Braille characters in the sequence. And it would therefore enable one to read the line of Braille characters across the character carriage 30 through the membrane 20. Upon completion of reading of one line of such Braille characters, the character carriage 30 moves downwardly on the base unit 10 and the Braille characters are changed to represent a next line of such characters on the membrane 20.

In a further embodiment, shown in FIGS. 5A-5C, each of the bead assemblies 52 further comprises a permanent magnet 53 attached thereto or alternately imbedded into the flat surface 59. An electromagnet 80 is positioned under each of the bead assemblies 52 and is thus enabled for repelling or attracting the permanent magnet 53 thereby rotating the bead assembly 52 between the UDP and the DDP depending upon which direction electrical current is caused to flow within the electromagnet circuit. Such is within the skill set of the routine electrical engineer, and to fabricate such a circuit. Again, when in position, the bead assembly 52 is held, positioned, or engaged by the release assembly 70. In this embodiment, the belt 60 is not used.

It is within the capability of one of skill in the art to provide the belt driving motor, the circuits for actuating the plural release assemblies 70 and the electromagnets 80.