austenite phase transforming to its austenitic or original shape. The force produced by the biasing means **283** is less than the force produced by the thin film SMA element **282** during this transformation. The thin film SMA element **282**, thereby, overcomes that force during this transformation, and, in so doing, extends the Braille dot **20** as shown in FIG. **9**B. The thin film SMA element **282** is heated by joule heating using electric current from an electric power source controlled by the microcontroller **40** (not shown in FIGS. **9**A or **9**B). Because the austenite phase is characterized by low ductility, high Young's modulus and high yield stress, the thin film SMA element **282** remains in its austenitic or original shape and the Braille dot **20** remains extended. When the electric current is removed, the thin film SMA element **282** cools to its martensitic transfer temperature at which point it transitions to the martensite phase and the external stress from the biasing means **283** deforms the thin film SMA element **282**, retracting the Braille dot **20**. Alternately, the thin film SMA element **282** can be operably connected to the Braille dot **20** to retract it when transitioning from its martensite phase to its austenite phase. The Braille dot **20**, then, will be extended by the biasing means **283**, when the thin film SMA element **282** transitions from the austenite phase to the martensite phase. The Braille dot **20** is extended and retracted based upon the crystalline phase of the thin film SMA element **282**. Instead of a spring as shown, the biasing means **283** can be any mechanism including a second thin film SMA element, a diaphragm or manipulated boss.

In FIG. **10**A and FIG. **10**B, the thin film SMA element is shown directly forming the Braille dot itself **282**. The Braille dot may be covered with a polymer cover **20** which can provide a biasing force to flatten the Braille dot. The biasing force may be provided by either a pressure or a vacuum applied through the orifice located directly under the SMA film **282**.

Similarly direct actuation of the Braille dot **20** can be accomplished with a MEMS device **16** utilizing other mechanisms not based on shape memory alloy like springs, diaphragms and bosses. It is only necessary to have opposite biasing forces operably attached to the Braille dot **20** in a manner such that the Braille dot **20** can be extended and retracted in response to signals from the microcontroller **40** or module microcontrollers **45**.

While the preferred embodiments of the invention have been shown and described, it will be apparent to those skilled in this art that various modifications may be made in these embodiments without departing from the teachings of the present invention.

What is claimed is:

1. A refreshable Braille display comprising:

a. a plurality of Braille dots that extend and retract arranged in Braille characters forming a Braille display such that said Braille dots are operable as a personal computer monitor on which information is displayed allowing a blind person to discern said information displayed thereon by reading said Braille characters formed by the extended Braille dots; and

b. a microelectromechanical device operably connected to each of said Braille dots such that said Braille dots retract and extend based upon the operation of said microelectromechanical device, said microelectromechanical device being operated electrostatically.

2. A refreshable Braille display for use with a personal computer, ATM machine and other embedded and portable devices having Braille translation software programmed therein comprising:

a. a housing;

b. a plurality of Braille dots arranged in Braille characters movably mounted in said housing and forming a Braille display;

c. a micoelectromechanical device operably attached to each of said Braille dots;

d. a microcontroller mounted in said housing and programmed to control the operation of said microelectromechanical device connected to said personal computer, ATM machine and other embedded and portable devices, such that information and data from said personal computer, ATM machine and other embedded and portable devices are translated and transferred to said microcontroller whereby said microcontroller operates said microelectromechanical device in response thereto such that said Braille dots extend and retract based upon the operation of said microelectromechanical device allowing a blind person to discern the information displayed thereon by reading by said Braille characters formed by the extended Braille dots; and

e. a compressor that provides air pressure to said microelectromechanical device whereby said mircoelectromechanical device is pressurized when it is opened and depressurized when it is closed thereby extending and retracting said Braille dot.

3. The refreshable Braille display of claim **2** further comprising a leak hole in said Braille dots such that said air pressure vents through said leak hole from said microelectromechanical device when it is closed.

4. The refreshable Braille display of claim **2** further comprising a vent in said microelectromechanical device such that said air pressure vents through said vent from said microelectromechanical device when it is closed.

5. The refreshable Braille display of claim **2** wherein said air pressure discharges to said compressor from said microelectromechanical device when it is closed.

6. A refreshable Braille display for use with a personal computer, ATM machine and other embedded and portable devices having Braille translation software programmed therein comprising:

a. a housing;

b. a plurality of Braille dots arranged in Braille characters movably mounted in said housing and forming a Braille display;

c. a microelectromechanical device operably attached to each of said Braille dots, said microelectromechanical device being operated electrostatically; and

d. a microcontroller mounted in said housing and programmed to control the operation of said microelectromechanical device connected to said personal computer, ATM machine and other embedded and portable devices, such that information and data from said personal computer, ATM machine and other embedded and portable devices are translated and transferred to said microcontroller whereby said microcontroller operates said microelectromechanical device in response thereto such that said Braille dots extend and retract based upon the operation of microelectromechanical device allowing a blind person to discern the information displayed thereon by reading said Braille characters formed by the extended Braille dots.

7. A refreshable Braille display having a certain size and arrangement for use with a personal computer, ATM machine and other embedded and portable devices having Braille translation software programmed therein comprising: