overcomes that force during this transformation, and, in so doing, extends the Braille dot **20** as shown in **FIG. 9B**. 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. 9A** or **9B**). 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. Again, similarly a piezoelectric element **282** can be used so when a electric field is applied the thin film expands resulting in a similar movement of the element **282**.

**[0053]** In **FIGS. 10A and 10B**, the thin film SMA or piezoelectric 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**.

**[0054]** In another embodiment shown in **FIG. 11**, the present invention includes an electrostatic microelectromechanical valve having a structure with an open and a closed position comprising an inlet port **301**; a base plate **302** containing an electrode **303**; and a closure diaphragm **304** containing an electrode **305** wherein the diaphragm **304** with a boss **306** for closing the inlet port **301** and at least two radial beams **307** to connect the boss **306** to the main microelectromechanical valve structure. **FIG. 11A** shows an open valve, **FIG. 11B** shows a closed valve and **FIG. 11C** shows the diaphragm from above. Preferably, the boss of the diaphragm is connected to the main microelectromechanical valve structure by at least four beams **307**, and more preferably by at least eight beams **307**. In **FIGS. 12 A, B**, C, D, E, F, G, and H, various electrostatic microelectromechanical valve diaphragm designs are shown. The diaphragm is supported by the valve structure. Preferably, at least 30% of the surface area of the unsupported area **308** of the diaphragm (when the valve is open) is open to allow air flow through, more preferably at least 45% and most preferably 60%.

**[0055]** It will be apparent to those skilled in the art that various modifications and variations can be made to the present invention without departing from the spirit and scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

We claim:

**1**. A refreshable Braille display system or module from such a system comprising

a) a plurality of microelectromechanical valves having a top surface and a bottom surface, each microelectromechancial valves having an opening or positioned in line with an opening each of which represents a Braille dot and each opening arranged in a pattern of Braille cells with the Braille cells forming a Braille display; and

b) an elastomeric polymer having a upper and a lower surface, the lower surface of the elastomeric polymer being sealed about each opening which represent the Braille dots;

wherein during operation of the display system the upper surface of the elastomeric polymer forms a plurality of Braille dots which are extended and retracted based upon the operation of the electromechanical valves.

**2**. The system or module in claim 1, wherein the elastomeric polymer is a continuous coating or film over the top of the housing for the Braille display.

**3**. The system or module in claim 2, wherein the elastomeric polymer has a modulus of elasticity less than about 500,000 psi.

**4**. The system or module in claim 3, wherein the continuous coating or film have a thickness from about 0.001 to about 1.25 mm.

**5**. The system or module in claim 4, wherein the microelectromechanical valves are electrostatically actuated.

**6**. The system or module in claim 5, wherein the elastomeric polymer is a thermoplastic polyolefin.

**7**. A refreshable Braille display system or a module from such a system comprising

a) a plurality of microelectromechanical piezoelectric based devices having a top surface and a bottom surface, each microelectromechancial piezoelectric based device having an opening or positioned in line with an opening each of which represents a Braille dot and each opening arranged in a pattern of Braille cells with the Braille cells forming a Braille display; and

b) an elastomeric polymer having a upper and a lower surface, the lower surface of the elastomeric polymer being sealed about the openings which represent the Braille dots;

wherein during operation of the display system the upper surface of the elastomeric polymer forms a plurality of Braille dots which are extended and retracted based upon the operation of the electromechanical piezoelectric based devices.

**8**. The system or module in claim 7, wherein the elastomeric polymer is a continuous coating or film over the top of the housing for the Braille display.