

chanical 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%.

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 microelectromechanical 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 500,000 psi.

4. The system or module in claim 3, wherein the continuous coating or film has a thickness from 0.001 to 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 of a module from such a system comprising

a) a plurality of microelectromechanical piezoelectric based devices having a top surface and a bottom surface, each microelectromechanical 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.

9. The system or module in claim 8, wherein the elastomeric polymer has a modulus of elasticity of less than 500,000 psi.

10. The system or module in claim 9, wherein the continuous coating or film has a thickness from 0.001 to 1.25 mm.

11. The system or module in claim 10, wherein the elastomeric polymer is a thermoplastic polyolefin.

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

a) a plurality of microelectromechanical shape memory alloy based devices having a top surface and a bottom surface, each microelectromechanical shape memory alloy 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 shape memory alloy based devices.

13. The system or module in claim 12, wherein the elastomeric polymer is a continuous coating or film over the top of the housing for the Braille display.

14. The system or module in claim 13, wherein the elastomeric polymer has a modulus of elasticity of less than 500,000 psi.

15. The system or module in claim 14, wherein the continuous coating or film has a thickness from 0.001 to 1.25 mm.

16. The system or module in claim 15, wherein the elastomeric polymer is a thermoplastic polyolefin.

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