

the actuator means to change between said memory shape and other shape for causing movement of the tactile element means relative to the reference structure.

8. A method as in claim 7 in which said tactile element means having a plurality of tactile elements, and said actuator means having a plurality of actuation said actuators and the associated tactile elements are positioned in a predetermined array, and said actuators are individually heated and cooled to cause them to respectively change between their memory shape and other shape in accordance with a predetermined sequence for causing movement of the tactile elements relative to the reference structure.

9. A method as in claim 8 in which said time-varying control signals are generated for operating individual actuators in accordance with said predetermined sequence, and the actuators are heated responsive to said time-varying signals.

10. A method as in claim 9 in which electric current pulses are directed through the actuators responsive to said time-varying signals to raise the temperature of selected actuators through said phase change transition temperature.

11. A method as in claim 10 in which the pulse-width of said electric current pulses is modulated at a predetermined frequency sufficient to prevent overheating of the actuator while it is in its memory shape.

12. A method as in claim 11 in which said pulse-width of said electric current pulses modulated at a predetermined frequency is carried out by controlling the pulse-width of each current pulse to be on for approximately the same fraction of time that the current pulse is off.

13. A method as in claim 7 in which said sequence of pulses is rapidly varied to correspondingly vary the sequence of movement of the tactile elements.

14. A method as in claim 7 further includes the step of holding the tactile element on said human sense organ while the sense organ moves.

15. A tactile stimulator array system for providing tactile feedback to a person comprising the combination of a plurality of tactile elements, each element having a touch-stimulating portion, a reference structure, means for mounting the tactile elements in a predetermined array relative to said reference structure for contact of said touch-stimulating portions by sense organs of a person, actuator means for moving the touch-stimulating portions between first and second positions, said actuator means including a plurality of actuators, each actuator being formed of a shape-memory alloy material which changes between a first memory shape when heated through the phase change transition temperature of the material and a second shape when cooled below that temperature, coupling means for operatively coupling each actuator with a respective tactile element for moving such element and its associated touch-stimulating portion between said first and second positions responsive to said change in shape of the actuator whereby movement of the touch-stimulating portions relative to the reference structure can be sensed by the person, said tactile elements being comprised of cantilever beams having proximal ends and distal ends, said proximal ends being carried by the reference structure and said distal ends comprising said touch-stimulating portions, said beams being formed of a flexible material having elastic memory, said actuators being in the shape of elongate strands, and said coupling means attaches said strands to a portion of respective beams at a position which applies a moment force for bending the

beams from a first position to a second position when the alloy material changes to its memory shape.

16. A tactile stimulator array system as in claim 15 in which said strands contract when the alloy material changes to its memory shape and said strands elongate when the alloy material is changed to its second shape, and the force of elastic memory of said beams acts against the strands to cause them to elongate as the beam bend back to their first positions.

17. A tactile stimulator array system for providing tactile feedback to a person comprising the combination of a plurality of tactile elements, each element having a touch-stimulating portion, a reference structure means for mounting the tactile elements in a predetermined array relative to said reference structure for contact of said touch-stimulating portions by sense organs of a person, actuator means for moving the touch-stimulating portions between first and second positions, said actuator means including a plurality of actuators, each actuator comprised of a shape-memory alloy material which changes between a first memory shape when heated through the phase change transition temperature of the material and a second shape when cooled below that temperature, coupling means for operatively coupling each actuator with a respective tactile element for moving such element and its associated touch-stimulating portion between said first and second positions responsive to said change in shape of the actuator whereby movement of the touch-stimulating portions relative to the reference structure can be sensed by the person wherein said tactile elements are formed by a base plate being comprised of a sheet of flexible metal and means forming a pattern of spaced-apart, parallel cuts through the metal to define laterally spaced-apart beams which are integrally joined at their proximal ends to un-cut portions of the base plate.

18. A method for providing tactile stimulation feedback for a person's sense organs, the method including the steps of mounting a tactile element means for movement between first and second positions relative to the reference structure for sensing by the person, coupling an actuator means of a shape-memory alloy material to the tactile element means, said material changing between a memory shape when heated through its phase change transition temperature and an other shape when cooled below that temperature, heating the actuator means through its phase change transition temperature to cause it to change its memory shape for moving the tactile element means to its second position responsive to said change of shape of the actuator means to its memory shape, cooling the actuator means to below its phase change transition temperature to cause the actuator means to move to its other shape for moving the tactile element means to its first position while moving the actuator means to its other shape, said tactile element means having a plurality of tactile elements and said actuator means having a plurality of actuators, said actuators and the associated tactile elements are positioned in a predetermined array, said actuators are individually heated and cooled to cause them to respectively change between their memory shape and other shape in accordance with a predetermined sequence for causing movement of the tactile elements relative to the reference structure, generating time-varying control signals for operating individual actuators in accordance with said predetermined sequence, the actuators are heated responsive to said time-varying signals, directing electric current pulses through the actuators responsive to said time-varying.

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