Claims

WHAT IS CLAIMED IS:

1. A method comprising:

compressing a void cell in a first matrix of void cells coupled together with an intermedial binding layer in a direction substantially normal to the intermedial binding layer without substantially compressing at least one fluidly connected neighboring void cell and at least one opposing void cell in a second opposing matrix of void cells, wherein the void cell is compressed within an independent compression range of the void cell; and

compressing the void cell outside the independent compression range of the void cell, wherein the intermedial binding layer is deflected and at least one opposing void cell in the second matrix of void cells is compressed, wherein the void cell has an opening in continuous fluid communication with an environmental external to the cellular cushioning system while the void cell is compressed and decompressed.

2. The method of claim 1, further comprising:

compressing the void cell outside the independent compression range of the void cell, wherein the intermedial binding layer is deflected and at least one opposing void cell in the second matrix of void cells is compressed.

32. The method of claim 21, wherein compressing the void cell outside the independent compression range requires greater force than compressing the void cell within the independent compression range.

43. The method of claim 1, further comprising:

de-compressing the void cell without de-compressing the at least one neighboring void cell.

54. The method of claim 1, further comprising:

compressing two or more void cells in the first matrix of void cells different deformation magnitudes within the independent compression range, wherein resistive force from each of the two or more void cells is substantially equal.

65. The method of claim 1, wherein each void cell in the first matrix of void cells has a substantially equal resistance to deformation at all deformation magnitudes within the independent compression range of the void cells.

76. The method of claim 1, wherein each void cell in the first matrix of void cells has an increasing resistance to deformation with increased deformation magnitude outside of the independent compression range of the void cells.

87. The method of claim 1, wherein the intermedial binding layer includes a first half that couples the first matrix of void cells together and a second half that couples the second matrix of void cells together, and wherein the first half and the second half are attached together.

98. The method of claim 87, wherein the first half and the second half are attached together using periodic spot welds of the first half to the second half.

109. A cellular cushioning system comprising:

a first matrix of void cells;

a second matrix of void cells opposing the first matrix of void cells, the first matrix and the second matrix each including at least one void cell with an opening in continuous fluid communication with an environment external to the cellular cushioning system during compression and decompression of the cellular cushioning system; and

an intermedial binding layer coupling at least two of the void cells in the first matrix of void cells and at least two of the void cells in the second matrix of void cells, wherein compression of a void cell in a direction substantially normal to the intermedial binding layer occurs without substantial deflection of at least one fluidly connected neighboring void cell and at least one opposing void cell, and wherein compression of the void cell is within an independent compression range of the void cell, and compression of the void cell outside the independent compression range of the void cell deflects the intermedial binding layer and compresses the at least one adjacent void cell.

1110. The cellular cushioning system of claim 109, further comprising:

a pixilated layer attached to outer extremities of two or more of the void cells in the first matrix of void cells.

1211. The cellular cushioning system of claim 109, wherein the void cells in the first matrix of void cells have an open face that faces an open face of the void cells in the second matrix of void cells, wherein the void cells in the first matrix of void cells generally align with the void cells in the second matrix of void cells.

1312. The cellular cushioning system of claim 109, wherein the intermedial binding layer has openings where each void cell meets the intermedial binding layer.

14. The cellular cushioning system of claim 10, wherein compression of the void cell outside the independent compression range of the void cell deflects the intermedial binding layer and compresses the at least one adjacent void cell.

1513. The cellular cushioning system of claim 149, wherein compression of the void cell outside the independent compression range requires greater force than compression of the void cell within the independent compression range.

1614. The cellular cushioning system of claim 109, wherein de-compression of the void cell occurs without de-compression of the at least one neighboring void cell.

1715. The cellular cushioning system of claim 109, wherein two or more void cells in the first matrix of void cells are compressed different deformation magnitudes within the independent compression range and resistive force from each of the two or more void cells is substantially equal.

1816. The cellular cushioning system of claim 109, wherein each void cell in the first matrix of void cells has a substantially equal resistance to deformation at all deformation magnitudes within the independent compression range of the void cells.

1917. The cellular cushioning system of claim 109, wherein each void cell in the first matrix of void cells has an increasing resistance to deformation with increased deformation magnitude outside of the independent compression range of the void cells.

2018. The cellular cushioning system of claim 109, wherein the intermedial binding layer includes a first half that couples the first matrix of void cells together and a second half that couples the second matrix of void cells together, and wherein the first half and the second half are attached together.

2119. The cellular cushioning system of claim 1018, wherein the first half and the second half are attached together using periodic spot welds of the first half to the second half.

2220. A method of manufacturing a cellular cushioning system comprising:

molding a first matrix of void cells open toward and interconnected by a first intermedial binding layer;

molding a second matrix of void cells open toward and interconnected by a second intermedial binding layer, the first matrix and the second matrix each including at least one void cell with an opening in continuous fluid communication with an environment external to the cellular cushioning system during compression and decompression of the cellular cushioning system; and

welding the first and second intermedial binding layers together so that openings in the void cells of the first and second intermedial binding layers face one another, wherein compression of a void cell in a direction normal to the intermedial binding layer occurs without substantial deflection of at least one fluidly connected neighboring void cell and at least one opposing void cell, and wherein compression of the void cell is within an independent compression range of the void cell; and

molding a pixilated layer; and

attaching the pixilated layer to an outer surface of each void cell of the first matrix of void cells.

23. The method of claim 22, further comprising:

molding a pixilated layer; and

attaching the pixilated layer to an outer surface of each void cell of the first matrix of void cells.

2421. The method of claim 2220, further comprising:

molding a third matrix of void cells open toward and interconnected by a third intermedial binding layer;

molding a fourth matrix of void cells open toward and interconnected by a fourth intermedial binding layer;

welding the third and fourth intermedial binding layers together so that openings in the void cells of the third and fourth intermedial binding layers face one another; and

attaching an outer surface of each of the void cells in the third matrix of void cells to an outer surface of each of the void cells in the second matrix of void cells.