CLAIMS

1. A structural element made from sheet material that is deformed at intervals along its length and width to provide pods that protrude from the plane of the sheet where the walls of the pods slope obliquely relatively to the plane of the sheet, wherein at least two sheets are formed with such pods, and two of the sheets are juxtaposed to each other in mirror-image, or facing, fashion, with floors of the pods engaging in contact zones, wherein the walls of engaged pods form diamond beam formations with adjacent engaged pods such that multiple diamond beam structures are formed in the structural element in the negative spaces immediately between pairs of engaged pods, and wherein mouths of the pods are round and arranged in rows, adjacent rows being staggered to define a regular grid with centrelines for the pods at 120º from one another, and the pods are spaced apart by only between 1 and 11% of the pod diameter.

2. A structural element made from sheet material that is deformed at intervals along its length and width to provide pods that protrude from the plane of the sheet where the walls of the pods slope obliquely relatively to the plane of the sheet, wherein at least two sheets are formed with such pods, and two of the sheets are juxtaposed to each other in mirror-image, or facing, fashion, with floors of the pods engaging in contact zones, wherein the walls of engaged pods form diamond beam formations with adjacent engaged pods such that multiple diamond beam structures are formed in the structural element in the negative spaces immediately between pairs of engaged pods, and wherein mouths of the pods are triangular and are arranged with interfacing sides so as to occupy substantially the whole of the upper reference plane of a first of the two sheets, just leaving a grid for that upper plane first sheet where the pods meet at their upper edges.

3. A structural element made from sheet material that is deformed at intervals along its length and width to provide pods that protrude from the plane of the sheet where the walls of the pods slope obliquely relatively to the plane of the sheet, wherein at least two sheets are formed with such pods, and two of the sheets are juxtaposed to each other in mirror-image, or facing, fashion, with floors of the pods engaging in contact zones, wherein the walls of engaged pods form diamond beam formations with adjacent engaged pods such that multiple diamond beam structures

are formed in the structural element in the negative spaces immediately between pairs of engaged pods, and wherein mouths of the pods are intermeshing regular hexagons and are arranged with interfacing sides so as to occupy substantially the whole of the upper reference plane of a first of the two sheets, just leaving a grid for that upper plane first sheet where the pods meet at their upper edges, the pods being spaced apart by between 1 and 11% of the pod diameter.

4. A structural element in the form of a structural panel consisting of two outer sheets that act as the tensile and compression chords, both with multiple inwardly orientated pods throughout the panel and whose inwardly orientated apexes are joined together, which pods have a close proximity one to another in order to be mechanically interdependent creating a double depth space-frame lattice type matrix where loads placed on the panel's surface are resisted and transferred through the chords and with the pods acting as interconnecting diagonal braces such that the loads are transmitted along the surfaces of the pods in multiple directions such that the loads are distributed throughout the structural element, wherein the walls of joined pods form diamond beam formations with adjacent joined pods such that multiple diamond beam structures are formed in the structural element in the negative spaces immediately between pairs of joined pods, and wherein the mouths of the pods are round and arranged in rows, adjacent rows being staggered to define a regular grid with centrelines for the pods at 120º from one another, and the pods are spaced apart by only between 1 and 11% of the pod diameter

5. A structural element in the form of a structural panel consisting of two outer sheets that act as the tensile and compression chords, both with multiple inwardly orientated pods throughout the panel and whose inwardly orientated apexes are joined together, which pods have a close proximity one to another in order to be mechanically interdependent creating a double depth space-frame lattice type matrix where loads placed on the panel's surface are resisted and transferred through the chords and with the pods acting as interconnecting diagonal braces such that the loads are transmitted along the surfaces of the pods in multiple directions such that the load is distributed throughout the structural element, wherein the walls of joined pods form diamond beam formations with adjacent joined pods such that multiple diamond beam structures are formed in the structural element in the negative spaces immediately between pairs of joined pods, and wherein the mouths of the pods are triangular and are arranged with

interfacing sides so as to occupy substantially the whole of the upper reference plane of a first of the two sheets, just leaving a grid for that upper plane first sheet where the pods meet at their upper edges.

6. A structural element in the form of a structural panel consisting of two outer sheets that act as the tensile and compression chords, both with multiple inwardly orientated pods throughout the panel and whose inwardly orientated apexes are joined together, which pods have a close proximity one to another in order to be mechanically interdependent creating a double depth space-frame lattice type matrix where loads placed on the panel's surface are resisted and transferred through the chords and with the pods acting as interconnecting diagonal braces such that the loads are transmitted along the surfaces of the pods in multiple directions such that the loads are distributed throughout the structural element, wherein the walls of joined pods form diamond beam formations with adjacent joined pods such that multiple diamond beam structures are formed in the structural element in the negative spaces immediately between pairs of joined pods, and wherein the mouths of the pods are intermeshing regular hexagons and are arranged with interfacing sides so as to occupy substantially the whole of the upper reference plane of a first of the two sheets, just leaving a grid for that upper plane first sheet where the pods meet at their upper edges, the pods being spaced apart by between 1 and 11% of the pod diameter.

7. A structural element according to any one of the preceding claims, wherein the two engaging sheets are of similar or substantially identical size and/or shape.

8. A structural element according to any one of the preceding claims, wherein the two engaging sheets are joined in the contact zones to provide a unitary element formed of the two sheets.

9. A structural element according to any one of the preceding claims, wherein the pods are frusto-conical in shape.

10. A structural element according to any one of the preceding claims, wherein the floor of the pod is circular.

11. A structural element according to any one of the preceding claims, wherein a part of the floor or base of one or more of the pods is removed to enhance the lightness of the finished element.

12. A structural element according to any one of the preceding claims, wherein a part of the floor or base of one or more of the pods is removed leaving a flange.

13. The structural element of claim 8, wherein the flange is an annular flange.

14. A structural element according to any one of the preceding claims, wherein one or more of the pods has more than one side.

15. A structural element according to claim 14, wherein these sides are each composed primarily of a flat area.

16. A structural element according to claim 2, claim 3, claim 5 or claim 6, wherein the pods occupy substantially the whole of a first of the two sheets, just leaving a grid for that first sheet where the pods meet at their upper edges.

17. A structural element according to any one of the preceding claims, wherein the pods are formed in the sheet using a press.

18. A structural element according to any one of claims 1 to 16, wherein the pods leave spaces between them in the material of the plane of the or each sheet around the pods, wherein the material of the plane of the sheet around the pods is provided with strengthening portions, such as corrugations, ridges or folds.

19. A structural element according to any one of the preceding claims, wherein the pods are arranged in rows on the plane of the sheet.

20. A structural element according to claim 19, wherein adjacent rows are staggered.

21. A structural element according to any one of the preceding claims, wherein the structural element is generally planar or flat.

22. A structural element according to any one of the preceding claims, wherein pods have webbing at the corners of the pods.

23. The structural element of any one of the preceding claims, wherein the height of the diamond is no more than double the width of the diamond.

24. A structural element according to any one of the preceding claims, wherein the depths of the pods are in the range of 7 to 20mm.

25. A structural element according to any one of the preceding claims, wherein the sides of the pods are predominantly at an angle between 30 and 80º from the plane of the first or second surface of the structural element.

26. A structural element according to any one of the preceding claims, wherein the pods' height does not exceed 10x the thickness of the sheet material from which it protrudes.

27. A structural element according to any one of the preceding claims, wherein foam is provided between the outer sheets to offer insulation or soundproofing properties .

28. A structural element according to any one of the preceding claims, wherein the inwardly oriented apexes are glued together.

29. A structural element according to any one of the preceding claims, wherein the structural element is made from two sheets of a fibrous or cellulose material such as paper or card.

30. A structural element according to any one of claims 1 to 28, wherein the structural element is formed from metal.

31. A structural element according to according to any one of the preceding claims, wherein the diamond beam structures are elongated to define a grid of diamond beam structures.

32. A structural element according to according to any one of the preceding claims, including a specifically identifiable material or element, or a chemical signature, within the material which forms the structural element.

33. A structural element according to any one of the preceding claims, wherein markings or watermarks are present on the inner surfaces of the outer sheets.

34. The structural element according to any one of the preceding claims, further incorporating a wireless, RFID, NFC or electronic communication device incorporated therein to allow remote electronic identification.

35. The structural element according to any one of the preceding claims, wherein the mouth of each pod and the apex of the beams have rounded edges.

36. A method for producing a structural element comprising providing a sheet material, deforming deformed it at intervals along its length and width to provide pods that protrude from the plane of the sheet where the walls of the pods slope obliquely relatively to the plane of the sheet, providing a second sheet, deforming it at intervals along its length and width to provide pods that protrude from the plane of the second sheet where the walls of the pods slope obliquely relatively to the plane of the second sheet, juxtaposing the two sheets such that the pods are juxtaposed to each other in mirror-image or aligning fashion and such that floors of the juxtaposed pods engage in contact zones, and joining the sheets in the contact zones to provide a unitary element, wherein the produced structural element is in accordance with any one of the preceding claims.

37. A method according to claim 36, wherein the two sheets are deformed at the same time.

38. A method according to claim 36 or claim 37, wherein the deformation is a single pass pressing action.

39. A method according to any one of claims 36 to 38, wherein the deformation is carried out using, or in conjunction with, any one or more of the following operations: bending, stamping, punching, blanking, embossing, bending or flanging.

40. A method according to any one of claims 36 to 39, wherein the method uses a coil fed high speed production line.

41. The method according to claim 40, wherein the structural element is a pallet, and the coil fed high speed production line produces around 20 pallets per minute.

42. A method according to any one of claims 36 to 41, wherein the at least parts of the floors of the pods are removed when, or prior to, the two sheets/contacting pods are joined together.

43. A method according to any one of claims 36 to 42, wherein the sheet is locally stretched when the pods are formed.

44. A pallet comprising a structural element according to any one of claims 1 to 35.

45. A pallet according to claim 44, wherein the structural element forms a panel that is raised off the ground by a base, which base is formed by legs or skids, the base being for suspending the panel above the surface of the ground.

46. A pallet according to claim 44 or claim 45 comprising legs having a cup shape.

47. A pallet according to claim 44 or claim 45, comprising legs having a half cup shape.

48. A pallet according to any one of claims 44 to 47, adapted for nested stacking of corresponding pallets.

49. A pallet according to any one of claims 44 to 48, wherein when multiple such corresponding pallets are stacked, a bottom of the base of a first pallet will sit below the upper surface of the structural element of the pallet below it.

50. A pallet according to any one of claims 44 to 49, wherein when multiple such corresponding pallets are stacked, a bottom of the base of a first pallet will sit below the lower plane of the structural element of the pallet below it.

51. A pallet according to claim 45, wherein the panel is formed using pairs of sheet material spaced apart by deformed sheet material, where the spacing and locations of the deformed sheet material are not such that forks of a forklift truck or pallet truck fit between the sheets.

52. A pallet according to claim 45, wherein the pods of the structural element panel are located so as not to provide appropriate openings for forks of a forklift truck or pallet truck.

53. A pallet according to claim 45, wherein the pods are staggered so as to result in no through passageways for forks of a forklift.

54. A pallet according to any one of claims 44 to 53, wherein the pallet has a base in the form of legs or skids, the base extending from, or extending from near, the edges and/or corners of the structural element.

55. A pallet according to claim 54, comprising not more than four legs.

56. A pallet according to claim 54 or claim 55, wherein at least one edge of the structural element overhangs the base, such that the length of the structural element is greater than the distance between the outermost edges of the base in the direction perpendicular to that overhanging edge.

57. A pallet according to claim 56, wherein the overhang is longer than the width of the leg's/base's bottom still measured in that same direction.

58. A pallet according to any one of claims 44 to 57, wherein the pallet has grooves or slots in the upper surface to allow the locating of the base of a second pallet when stacking without full nesting, i.e. only partial nesting.

59. A pallet according to any one of claims 44 to 57, wherein the pallet has grooves or slots in its upper surface to allow the locating of a base of a second pallet therein when stacking.

60. A pallet according to any one of claims 44 to 59, provided in combination with a base plate onto which a base of the pallet may stand.

61. A pallet according to claim 60, wherein the base plate has wheels on its bottom.

62. A pallet according to claim 60 or claim 61, wherein the base plate has grooves or slots into which the base of the pallet can fit.

63. A stack of pallets according to claim 56 or claim 57, wherein the pallets are stacked with the base of higher pallets stood on top of the structural element of the pallet immediately below it, and relatively rotated such that the overhang alternates from one edge to the opposite edge.

64. The structural element of any one of claims 1 to 28, further incorporating a wireless, RFID, NFC or electronic communication device therein to allow remote electronic identification of the structural element, wherein the structural element is formed from metal or an electrically conductive material, the structural element being used as an aerial for the wireless, RFID, NFC or other electronic communication device.

65. A skateboard comprising a structural element according to any one of claims 1 to 35.

66. A panel on a vehicle comprising a structural element according to any one of claims 1 to 35.

67. Packaging comprising a structural element according to any one of claims 1 to 35.

68. Furniture surfaces comprising a structural element according to any one of claims 1 to 35.

69. Building materials comprising a structural element according to any one of claims 1 to 35.

70. A platform for supporting a person’s weight comprising a structural element according to any one of claims 1 to 35.

71. A box formed from a structural element according to claim 29.