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Support product

Abstract

A support product configured to receive poured concrete, the support product comprising a latticework of walls and a plurality of edges, wherein the walls extend between a lower surface and an upper surface and define a plurality of cells, wherein at least one edge comprises a catch and a partial keyway, wherein the catch is configured to connect with a catch of an adjacent support product to restrain relative movement of connected support products, and wherein the partial keyway is configured to be located adjacent to a partial keyway of a connected support product, so that adjacent partial keyways define a complete keyway between connected support products.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION

(1) This application claims priority to Australian Patent Application Nos. 2021221537, filed Aug. 24, 2021; 2021902684, filed Aug. 24, 2021; and 2022221468, filed Aug. 24, 2022; and to New Zealand Patent Application No. 779387, filed Aug. 24, 2021, all of which are incorporated herein by reference in their entireties.

TECHNICAL FIELD

(2) The present disclosure relates to a support product.

(3) More particularly, the present disclosure relates to a support product used in construction of composite concrete trafficable pavements.

BACKGROUND

(4) Traditionally, pavements are constructed as either flexible pavement or rigid pavements, each type of construction having specific benefits and drawbacks.

(5) Pavements as described herein include any trafficable substance laid down on an area intended to sustain vehicular or foot traffic. For example, but not limited to, footpaths, cycle paths, roads, rail track beds, parking lots and runways.

(6) Flexible pavements consist of a sub-base course laid onto subgrade or existing native material, a base course laid on top of the sub-base, and a bituminous surface course laid on the base course.

(7) The surface course consists of one or more bituminous or hot mix asphalt (HMA) layers.

(8) The structural capability of the flexible pavement is determined by the combination of the different layers, and the surface course alone has negligible structural integrity, as the load is distributed into the subjacent layers.

(9) Although by volume the materials required to construct flexible pavements are relatively cheap, the nature of the construction means that, especially in roads requiring high loads, the depth and material volume required is significant, with highways requiring over a metre of additional material to be provided on top of the sub-grade.

(10) Therefore, the cost of construction of flexible pavements, especially those experiencing high loads, is significant.

(11) Similarly, the logistical requirements of getting the required volume of materials to remote locations is also problematic.

(12) Damage to flexible pavements is also common, as the surface course does not have significant structural integrity, and holes can be caused by impacts such as rocks being forced into the surface by traffic loads.

(13) As vehicles pass across the surface course of a flexible pavement, the friction from the tires causes it to expand. Over time, this can lead to surface cracks, allowing water to gradually erode the surface course from underneath, causing larger cracks and pot holes to form.

(14) Where cavities or voids appear in either the base course or sub-base, which may result from a pothole or other defects, repair of the flexible pavement is difficult and costly, as the entire section of pavement must be excavated and re-laid.

(15) The flexible pavement is also affected by extreme temperatures which cause the surface to become tacky which leads to further deterioration.

(16) Rigid pavements, on the other hand, include a surface course, typically in the form of a concrete slab, poured above a base course and possibly a sub-base laid upon the subgrade.

(17) The rigidity provided by the concrete slab allows the load to be distributed more evenly, potentially allowing for fewer, or shallower, subjacent courses.

(18) Concrete is adversely affected by temperature changes, and expansion and associated cracking must be mitigated by having a number of separate slabs, with adjacent slabs tied together with steel dowels or ties bars or example.
(19) Concrete is also very expensive by volume, and although the construction of a rigid pavement requires less depth than a flexible pavement, the cost of construction is greater by area, primarily due to the concrete required.
(20) Additionally, the logistic of providing concrete to remote locations is significant, and as such, rigid pavements are simply not an option for many remote applications.
(21) Cracking of concrete is common due to high loads, especially towards edges of slabs where the supporting base course may be more susceptible to movement.
(22) Repair of concrete slabs is also more difficult than flexible pavements, as a cracked concrete slab must be cut out and new concrete poured in place, rather than simply filling a small hole with bituminous or HMA product.
(23) In addition, where cavities or subsidence appears in either the base course or sub-base, repair of the rigid pavement is difficult and costly, as the entire section of pavement must be excavated and re-laid.
(24) Consideration of cost alone allows a determination to be made on the cheapest option for type of pavement, with soil CBR (California Bearing Ratio) and traffic load in MSA (Million Standard Axles) being contributing factors.
(25) However, rigid pavements require significantly higher CO.sub.2 emissions, with the total emissions during construction being 5 to 6 times higher than flexible pavements, largely due to the concrete volumes.
(26) In summary, known methods of construction of pavements are costly, requiring large material volumes and CO.sub.2 emissions, and are difficult to repair.
(27) It is to be understood that, if any prior art publication is referred to herein, such reference does not constitute an admission that the publication forms a part of the common general knowledge in the art, in Australia or any other country.

SUMMARY

(28) In some embodiments, there is provided a support product. The support product may comprise a plurality of walls. At least some of the plurality of walls may define cells. The plurality of walls may comprise: an edge wall defining an edge plane that is parallel to the edge wall; and a plurality of partial keyway walls defining a partial keyway. The plurality of partial keyway walls may comprise: a pair of offset partial keyway walls that extend parallel to a first direction that is transverse to the edge plane; and a transverse partial keyway wall extending from one of the pair of offset partial keyway walls to the other of the pair of offset partial keyway walls.
(29) In some embodiments, the pair of offset partial keyway walls comprises: a first partial keyway wall, the first partial keyway wall extending from a first junction to a second junction, the first junction being a junction between the first partial keyway wall and the edge wall and the second junction being a junction between the first partial keyway wall and the transverse partial keyway wall; and a second partial keyway wall, the second partial keyway wall extending from a third junction to a wall end portion, the third junction being a junction between the transverse partial keyway wall and the second partial keyway wall.
(30) In some embodiments, a keyway opening is defined between the first junction and the wall end portion.
(31) In some embodiments, the first partial keyway wall and the edge wall define an acute angle therebetween.
(32) In some embodiments, the first partial keyway wall and the transverse partial keyway wall define an acute angle therebetween.
(33) In some embodiments, the transverse partial keyway wall and the second partial keyway wall define an obtuse angle therebetween.

(34) In some embodiments, the second partial keyway wall is longer than the first partial keyway wall.
(35) In some embodiments, there is provided a support product. The support product may comprise: a plurality of walls defining cells; and a partial keyway that is configured to receive part of a key. The partial keyway may extend inwardly from an edge of the support product. The partial keyway may be configured to inhibit outward motion of the key when the part of the key is within the partial keyway.
(36) In some embodiments, the partial keyway is defined by a plurality of partial keyway walls.
(37) In some embodiments, there is provided a support product. The support product may comprise: a plurality of cells; and a plurality of partial keyway walls defining a partial keyway. The support product may be configured to be aligned with a second support product such that the partial keyway and a second partial keyway of the second support product form a keyway configured to receive a key. In use, the partial keyway walls may be configured to cooperate with the key to inhibit relative movement of the support product and the second support product.
(38) In some embodiments, the partial keyway extends inwardly from an edge of the support product.
(39) In some embodiments, there is provided a support product. The support product may comprise: a plurality of walls at least partially defining a cell structure that comprises a plurality of cells, the cell structure being repeated throughout at least part of the support product. Each wall of the plurality of walls may meet another wall of the plurality of walls at a junction. A perimeter profile of the cell structure may be determined by connecting the junctions with straight lines forms an asymmetric polygon.
(40) In some embodiments, each instance of the cell structure shares at least one wall in common with another instance of the cell structure.
(41) In some embodiments, one or more of the cells of the cell structure is a quadrilateral.
(42) In some embodiments, one or more of the cells of the cell structure is symmetrical.
(43) In some embodiments, one or more of the cells of the cell structure is regular.
(44) In some embodiments, the cell structure comprises: a first group of cells that comprises a first axis of symmetry; and a second group of cells that comprises a second axis of symmetry.
(45) In some embodiments, the first group of cells is symmetric with respect to the second group of cells about a third axis of symmetry.
(46) In some embodiments, the plurality of cells comprises a first cell of a first shape, the first shape being defined, at least in part, by a first subset the plurality of walls.
(47) In some embodiments, the plurality of cells comprises a second cell of a second shape, the second shape being defined, at least in part, by a second subset the plurality of walls, the second subset comprising at least one wall of the first subset.
(48) In some embodiments, the first group of cells comprises the first cell and the second cell.
(49) In some embodiments, the first cell and the second cell share a wall of the plurality of walls.
(50) In some embodiments, the first axis of symmetry extends along at least part of the shared wall.
(51) In some embodiments, the plurality of cells comprises a third cell of a third shape, the third shape being defined by a third subset of the plurality of walls, the third subset comprising at least one wall from the first subset and at least one wall from the second subset.
(52) In some embodiments, the plurality of cells comprises a fourth cell of a fourth shape, the fourth shape being defined, at least in part, by a fourth subset the plurality of walls.
(53) In some embodiments, the plurality of cells comprises a fifth cell of a fifth shape, the fifth shape being defined, at least in part, by a fifth subset the plurality of walls, the fifth subset comprising at least one wall of the fourth subset.
(54) In some embodiments, the plurality of cells comprises a sixth cell of a sixth shape, the sixth shape being defined, at least in part, by a sixth subset of the plurality of walls, the sixth subset comprising at least one wall of the fifth subset.

(55) In some embodiments, the second group of cells comprises the fourth cell and the fifth cell.
(56) In some embodiments, the fourth cell and the fifth cell share a wall of the plurality of walls.
(57) In some embodiments, the second axis of symmetry extends along at least part of the shared wall.
(58) In some embodiments, the third axis of symmetry bisects the third cell.
(59) In some embodiments, the support product further comprises a partial keyway that is configured to receive part of a key. The partial keyway may extend inwardly from an edge of the support product. The partial keyway may be configured to inhibit outward motion of the key when the part of the key is within the keyway.
(60) In some embodiments, the partial keyway is defined by a plurality of partial keyway walls.
(61) In some embodiments, the cells are configured to receive a fill material.
(62) In some embodiments, the partial keyway defines a re-entrant corner of the support product.
(63) In some embodiments, the support product further comprises a male catch that projects outwardly. The male catch may comprise: an outer catch portion of a first width; and an inner catch portion of a second width. The first width may be greater than the second width.
(64) In some embodiments, the male catch projects outwardly from one of the minor faces.
(65) In some embodiments, the support product further comprises a female catch in the form of a groove in one of the walls of the plurality of walls.
(66) In some embodiments, the support product comprises opposed major faces comprising a first major face and a second major face.
(67) In some embodiments, the support product comprises a plurality of edge regions.
(68) In some embodiments, each edge region comprises a respective minor face of the support product.
(69) In some embodiments, one of the edge regions comprises the partial keyway.
(70) In some embodiments, the support product comprises a plurality of male catches and a plurality of female catches. The plurality of male catches may project outwardly from one or more walls of one of the edge regions. The plurality of female catches may be located on one or more walls of an edge region that is adjacent to the edge region from which the plurality of male catches project outwardly.
(71) In some embodiments, the support product is rectangular and comprises four edge regions.
(72) In some embodiments, the edge region that comprises the partial keyway also comprises the edge wall.
(73) In some embodiments, one or more of the plurality of walls extends at least partially between the first major face and second major face.
(74) In some embodiments, one or more of the plurality of walls extends from the first major face to the second major face.
(75) In some embodiments, one or more of the cells extends at least partially between the first major face and the second major face.
(76) In some embodiments, one or more of the cells extends from the first major face to the second major face.
(77) In some embodiments, the support product comprises: a plurality of partial keyways that comprises the partial keyway; and one or more additional partial keyways.
(78) In some embodiments, each edge region comprises at least one partial keyway of the plurality of partial keyways.
(79) In some embodiments, the support product further comprises an access cell that is configured to enable access beneath the support product.
(80) In some embodiments, a junction between a number of the walls of the plurality of walls comprises the access cell.
(81) In some embodiments, a cross-sectional profile of the access cell is circular.
(82) In some embodiments, the access cell comprises inwardly projecting projections.

(83) In some embodiments, one or more of the plurality of walls has a height that is between 20 mm and 100 mm.
(84) In some embodiments, one or more of the plurality of walls is thicker at a lower portion than at a higher portion.
(85) In some embodiments, the support product further comprises a planar portion. The planar portion may extend generally parallel to the axes of a reference plane. The planar portion may comprise one or more channels extending from one face of the planar portion and an opposing face of the planar portion. The one or more channels may be aligned with one or more respective cells of the support product, providing a hole therethrough.
(86) In some embodiments, the support product comprises a polymer.
(87) In some embodiments, there is provided a pavement course comprising the support product.
(88) In some embodiments, the pavement course further comprises the fill material. The cells may contain the fill material. The fill material may comprise one or more of: a cementitious material; a bituminous material; and a granular fill material.
(89) In some embodiments, there is provided a path comprising the support product.
(90) In some embodiments, the path may further comprise the fill material. The cells may contain the fill material. The fill material may comprise one or more of: a cementitious material; a bituminous material; and a granular fill material.
(91) In accordance with one aspect of the present disclosure, there is provided a support product configured to receive poured concrete, the support product comprising a latticework of walls and a plurality of edges, wherein the walls extend between a lower surface and an upper surface and define a plurality of cells, wherein at least one edge comprises a catch and a partial keyway, wherein the catch is configured to connect with a catch of an adjacent support product to restrain relative movement of connected support products, and wherein the partial keyway is configured to be located adjacent to a partial keyway of a connected support product, so that adjacent partial keyways define a complete keyway between connected support products.
(92) In some embodiments, the support product is constructed of polymer.
(93) In some embodiments, the support product is rectangular and comprises four edges.
(94) In some embodiments, each edge comprises at least one catch and at least one partial keyway, wherein partial keyways of opposed edges are symmetrical.
(95) In some embodiments, each edge comprises at least two partial keyways.
(96) In some embodiments, each edge comprises at least four partial keyways.
(97) In some embodiments, each edge comprises at least two catches.
(98) In some embodiments, each edge comprises at least four catches.
(99) In some embodiments, each catch is either a first part or a second part.
(100) In some embodiments, the first part is a male pin and the second part is a female slot.
(101) In some embodiments, the first part is an over hook and the second part is an under hook.
(102) In some embodiments, a pair of adjacent edges of the support product comprises catches having a first part, and an opposed pair of adjacent edges of the support product comprises catches having a second part, to facilitate assembly of a large number of support products.
(103) In some embodiments, each catch is comprised of a slot, and support products are connected using an intermediary connector.
(104) In some embodiments, the intermediary connector is cotton reel shaped, having wider ends and a narrower mid-portion.
(105) In some embodiments, partial keyways of adjacent support products define a complete keyway having a shape configured to prevent separation of adjacent support products.
(106) In some embodiments, partial keyways of adjacent support products define a complete keyway having a chevron shaped section.
(107) In some embodiments, the support product is symmetrical about both a horizontal centreline and a vertical centreline.

(108) In some embodiments, the support product further comprises a cylindrical access cell, to facilitate access below the support product.
(109) In some embodiments, the cylindrical access cell comprises protrusions into the cell to retain the hardened concrete cylinder and prevent it from being accidentally ejected.
(110) In some embodiments, the latticework of walls is between 20 mm and 100 mm high.
(111) In some embodiments, the latticework of walls is between 30 mm and 50 mm high.
(112) In some embodiments, the walls of the latticework are of substantially identical cross-section.
(113) In some embodiments, the walls of the latticework comprise a T section, wherein the wall includes a wider section at the lower surface, to provide additional weight bearing capability when not filled with concrete.
(114) In accordance with another aspect of the present disclosure there is provided a pavement course comprising a plurality of connected support products, wherein each support product comprises; a latticework of walls and a plurality of edges, wherein the walls extend between a lower surface and an upper surface and define a plurality of cells, wherein at least one edge comprises a catch and a partial keyway, wherein adjacent support products are connected by respective catches to restrain relative movement, and wherein the partial keyway is located adjacent to a partial keyway of a connected support product, so that adjacent partial keyways define a complete keyway between connected support products, and wherein the pavement course comprises concrete extending from the lower surface to the upper surface so that the cells and keyways are substantially filled with concrete.
(115) In some embodiments, the pavement course further comprises an edge formwork piece configured to connect to catches of the support products, wherein the edge formwork pieces define an edge of the pavement course.
(116) In some embodiments, the edge formwork piece is constructed of a constant section, having a slot configured to receive an intermediary connector.
(117) In some embodiments, the edge formwork piece comprises catches configured to connect with catches of the support product.
(118) In accordance with another aspect of the present disclosure there is provided a method of constructing a pavement course, wherein the pavement course comprises a plurality of connected support products, wherein each support product comprises; a latticework of walls and a plurality of edges, wherein the walls extend between a lower surface and an upper surface and define a plurality of cells, wherein at least one edge comprises a catch and a partial keyway, and wherein each partial keyway is configured to be located adjacent to a partial keyway of a connected support product, so that adjacent partial keyways define a complete keyway between connected support products, and wherein the method comprises the following steps: a. Connecting a plurality of support products using adjacent catches, to create an array substantially spanning an area for which the pavement course is to be provided, b. Pouring concrete onto the array, so that the cells and complete keyways of the array of support products are substantially filled with concrete, c. Allowing the concrete to set.
(119) In some embodiments, the method comprises the following step after step b: bi. Levelling the upper surface using a vibrating screed.
(120) In some embodiments, the method further comprises the following step after step c: ci. once the concrete has hardened, finishing the upper surface using a chopper.
(121) In accordance with another aspect of the present disclosure there is provided a method of repairing a void in a pavement course, wherein the pavement course comprises a plurality of connected support products, wherein each support product comprises; a latticework of walls, a cylindrical access cell and a plurality of edges, wherein the walls extend between a lower surface and an upper surface and define a plurality of cells, wherein at least one edge comprises a catch and a partial keyway, wherein adjacent support products are connected by respective catches to restrain relative movement, and wherein the partial keyway is located adjacent to a partial keyway of a

connected support product, so that adjacent partial keyways define a complete keyway between connected support products, and wherein the pavement course comprises concrete extending from the lower surface to the upper surface so that the cells and keyways are substantially filled with concrete, and wherein the method comprises the following steps: a. Drilling through the concrete of a cylindrical access cell, wherein the cylindrical access cell is located above the void to be repaired b. Injecting filler product (not shown) into the void until the void, and the cylindrical access cell are substantially filled.

(122) In some embodiments, the filler product is selected from a list comprising; non-shrink construction grout, expanding foam, expanding polymer based grouts and other chemical grouts.

Description

BRIEF DESCRIPTION OF DRAWINGS

(1) The present disclosure will now be described, by way of example, with reference to the accompanying drawings, in which:

(2) FIG. **1***a* is a cross-section of a conventional construction of a flexible pavement, showing the different courses of material.

(3) FIG. **1***b* is a cross-section of a conventional construction of a rigid pavement, showing the different courses of material.

(4) FIG. **1***c* is a cross-section of a conventional construction of a flexible pavement, showing the load applied by a wheel and how this can affect the subjacent course, creating a void, exemplary of a problem experienced by such pavements.

(5) FIG. **1***d* is a cross-section of a conventional construction of a rigid pavement, showing the load applied by a wheel and how this can affect the subjacent course, creating a void, exemplary of a problem experienced by such pavements.

(6) FIG. **2** is a plan view of a support product according to an embodiment of the present disclosure, with a region identified as ‘A’.

(7) FIG. **3** is a close-up of region ‘A’, depicting the edge of a support product according to an embodiment of the present disclosure, showing a catch and a partial keyway.

(8) FIG. **4** is a close-up of a portion of a support product according to an embodiment of the present disclosure, showing a pattern of latticework walls and a cylindrical access cell.

(9) FIG. **5**A is an isometric view showing a support product according to an embodiment of the present disclosure.

(10) FIG. **5**B is an isometric view of the support product of FIG. **5**A showing a number of edge regions.

(11) FIG. **6** is an isometric view showing an edge formwork piece connected to a support product according to an embodiment of the present disclosure.

(12) FIG. **7** is a plan view showing an edge formwork piece connected to a support product according to an embodiment of the present disclosure.

(13) FIG. **8** is a plan view showing a pavement comprising an array of connected support products according to an embodiment of the present disclosure, to illustrate the pattern once the support products have been filled with concrete.

DETAILED DESCRIPTION

(14) FIG. **1***a* shows a conventionally constructed flexible pavement **1**. The flexible pavement comprises a surface course **3**, a base course **5** and a sub-base **7** provided on top of a subgrade **9**. It will be understood that the sub-base **7** may be optional. FIG. **1***b* shows a conventionally constructed rigid pavement **11**. The rigid pavement **11** comprises a surface course **13**, a base course and a sub-base **17** provided on top of subgrade **19**. It will be understood that the sub-base **17** may be optional.

(15) FIG. **1***c* shows a typical load **90** applied to a conventionally constructed flexible pavement **92**. FIG. **1***c* also shows a distribution **94** of this load **90** into a base course **96** or other subjacent course. FIG. **1***d* shows the typical load **90** applied to a conventionally constructed rigid pavement **98**. FIG. **1***d* also shows a distribution **102** of this load **90** into a base course **104** or other subjacent course.
(16) Support Product
(17) Referring to FIGS. **2** to **5**, there is shown a support product **10**. The support product **10** may be in the form of a panel. The support product **10** is configured to receive a fill material. The fill material may comprise one or more of a cementitious material, a bituminous material and a granular fill material. Therefore, in some embodiments, the support product **10** is configured to receive poured concrete.
(18) The support product **10** is configured to be connected to a plurality of additional support products **10**. Once connected, the fill material is provided to the support products **10**. The fill material may comprise one or more of a cementitious material such as cement, a bituminous material such as asphalt, and a granular fill material such as gravel. The filled support product **10** provides part of a path for the conveyance of traffic. As described herein, existing flexible pavements require a significant volume of material and depth, with an associated significant cost of construction. Damage to flexible pavements is also common. Rigid pavements are adversely affected by temperature changes, which can cause expansion and subsequent cracking of the rigid pavements. Rigid pavements can also be relatively expensive to construct and difficult to repair. The support product **10** described herein can enable the construction of a path such as a pavement for the conveyance of traffic that provides benefits that are typically only provided by one of flexible pavements or rigid pavements, as described in more detail below.
(19) The support product **10** is configured to receive poured concrete. While described in the context of poured concrete, it will be understood that the support product **10** is also configured to receive other fill materials. The support product **10** comprises a latticework of walls **20** and a plurality of edges, wherein the walls **20** extend between a lower surface and an upper surface and define a plurality of cells **26**, wherein at least one edge comprises a catch and a partial keyway **50**, wherein the catch is configured to connect with a catch of an adjacent support product **10** to restrain relative movement of connected support products **10**, and wherein the partial keyway **50** is configured to be located adjacent to a partial keyway **50** of a connected support product **10**, so that adjacent partial keyways **50** define a complete keyway **55** between connected support products **10**.
(20) The support product **10** comprises a pair of opposed major faces **14**, **16**. The pair of opposed major faces **14**, **16** comprises a first major face **14** and a second major face **16**. The first major face **14** is parallel to the second major face **16**. The support product **10** is generally rectangular. Therefore, the first major face **14** and the second major face **16** are generally rectangular. It is acknowledged that the term rectangular as used herein also includes square.
(21) The support product **10** comprises a plurality of edge regions **62**, **64**, **66**, **68** (see FIG. **5**B). The illustrated support product **10** comprises four edge regions **62**, **64**, **66**, **68**. The support product **10** comprises a first edge region **62**. The support product comprises a second edge region **64**. The second edge region **64** is adjacent to the first edge region **62**. The support product comprises a third edge region **66**. The third edge region **66** is adjacent to the second edge region **64**. The support product comprises a fourth edge region **68**. The fourth edge region **68** is adjacent to the third edge region **66** and the first edge region **62**.
(22) In some embodiments, the edge regions **62**, **64**, **66**, **68** may be referred to as edges. In other words, in some embodiments, the support product **10** comprises a plurality of edges **30**. Therefore, the support product **10** may be said to be rectangular and comprise four edges.
(23) The support product **10** comprises a plurality of minor faces **63**, **65**, **67**, **69**. The support product **10** comprises a first minor face **63**. The first edge region **62** comprises the first minor face **63**. The support product **10** comprises a second minor face **65**. The second edge region **64** comprises the second minor face **65**. The second minor face **65** is orthogonal to the first minor face

63. The support product **10** comprises a third minor face **67**. The third edge region **66** comprises the third minor face **67**. The third minor face **67** is orthogonal to the second minor face **65**. The third minor face **67** is parallel to the first minor face **63**. The support product comprises a fourth minor face **69**. The fourth edge region **68** comprises the fourth minor face **69**. The fourth minor face **69** is parallel to the second minor face **65**. The fourth minor face **69** is orthogonal to the first minor face **63** and the third minor face **67**.

(24) Each of the plurality of minor faces **63**, **65**, **67**, **69** can be considered to define an edge of the support product.

(25) The support product **10** comprises a plurality of walls **20**. The walls **20** extend at least partially between the first major face **14** and the second major face **16**. In some embodiments, one or more of the walls **20** extend from the first major face **14** to the second major face **16**. The support product **10** comprises a plurality of cells **26**. The walls **20** meet at junctions to form the cells **26**. In other words, the plurality of cells **26** are defined by the walls **20**.

(26) In some embodiments, the walls **20** may be said to extend between a lower surface and an upper surface to define the plurality of cells **26**. That is, each wall **20** may be said to extend from a lower surface (of that wall **20**) to an upper surface (of that wall **20**) to define at least part of a respective cell **26**.

(27) Each wall **20** extends, to some extent, along a respective longitudinal axis **21**, lateral axis **23** and vertical axis **25**. By way of example, the longitudinal axis **21**, lateral axis **23** and vertical axis **25** of wall **20**′ are shown in FIG. **6**. Each of the longitudinal axis **21**, lateral axis **23** and vertical axis **25** of a particular wall **20** are orthogonal with respect to the other two axes. As the orientation of various walls **20** is different, each wall **20** may be considered to have its own associated longitudinal axis **21**, lateral axis **23** and vertical axis **25**.

(28) Each wall **20** has a pair of major wall faces. Each wall **20** has an associated thickness at each portion of the wall **20**. The thickness of a portion of a wall **20** may be considered to be a dimension of the relevant wall **20** at that portion, measured in a direction parallel to the lateral axis **23** of the wall **20**. In some embodiments, the thickness of a particular portion of a wall **20** may be considered to be the shortest distance between the major faces of the wall **20** at that portion.

(29) One or more of the walls **20** can be considered to have a first longitudinal end **27** and a second longitudinal end **29**. Each wall **20** has an associated length. The length of a particular wall **20** may be considered to be a distance between the first longitudinal end **27** of the relevant wall **20** and the second longitudinal end **29** of that wall **20** (see FIG. **5**) measured in a direction parallel to the longitudinal axis **21**. As described herein, a number of the walls **20** meet other walls **20** at one or more junctions **28**. In some embodiments, the end of a wall **20** may be considered to be taken as a centre point of the relevant junction **28**. In some embodiments, the end of a wall **20** may be considered to be where the wall meets the junction **28**.

(30) One or more of the walls **20** can be considered to have a base end **31** and an elevated end **33**. Each wall **20** has an associated height. The height of a particular wall **20** may be considered to be a distance between the base end **31** and the elevated end **33**.

(31) Each cell **26** has at least one cell opening. The cells **26** are configured to receive the fill material via the cell opening(s). The walls **20** define the cell openings. In the illustrated embodiment, each cell **26** comprises a first cell opening **35**. The first cell opening **35** is defined by the elevated end **33** of the walls **20** defining the relevant cell **26**. Each cell **26** also comprises a second cell opening **37**. The second cell opening **37** is defined towards the base end **31** of the walls **20** defining the relevant cell **26**. Each cell **26** of the illustrated embodiment defines a channel. The cells **26** extend at least partially between the first major face **14** and the second major face **16**. In the illustrated embodiment, the cells **26** extend from the first major face **14** to the second major face **16**. The cells of the illustrated embodiment therefore define channels that fluidly connect the first major face **14** and the second major face **14** of the support product **10**.

(32) In some embodiments, the wall thickness of one or more of the walls **20** is constant. In some

embodiments, the thickness of one or more of the walls **20** may change across the wall **20**. For example, in some embodiments, the thickness of one or more of the walls **20** may increase along at least part of the wall **20** from near or at the base end **31** towards the elevated end **33**. In other words, the thickness of one or more of the walls **20** may be greater at the elevated end **33** than near or at the base end **31**. In some embodiments, the thickness of one or more of the walls **20** may decrease along the wall from the base end **31** to the elevated end **33**. In other words, the thickness of one or more of the walls **20** may be lower at the elevated end **33** than at the base end **31**.

(33) One or more of the walls includes an opening **34** (see FIG. **5**). In particular, one or more of the walls includes a plurality of openings **34**. In the illustrated embodiment, the walls **20** that define the cells **26** comprise two openings **34** each. The openings fluidly connect the cells **26**. That is, the openings **34** enable a fluid contained in one cell **26** to move to an adjacent cell **26**, via the openings **34**. The openings **34** are located at the longitudinal ends **27**, **29** of the walls **20**. The openings **34** are located closer to the base end **31** of the walls **20** than the elevated end **33**. In some embodiments, the openings **34** extend from at or near the base end of the walls **20**, towards the elevated end **33**, at the longitudinal ends **27**, of the walls **20**.

(34) In some embodiments, it will be appreciated that the one or more of the walls **20** do not comprise the openings **34**.

(35) As described herein, the walls **20** of the support product **10** define a latticework. In some embodiments, a height of the support product **10** is between 20 mm and 100 mm or between 30 mm and 50 mm. In some embodiment, one or more of the walls **20** has a height between 20 mm and 100 mm or between 30 mm and 50 mm. In some embodiments, the latticework of walls **20** may be between 20 mm and 100 mm high. In some embodiments, the latticework of walls **20** may be between 30 mm and 50 mm high.

(36) The walls **20** may be of substantially identical cross-section.

(37) The support product **10** may be symmetrical about both a horizontal centreline and a vertical centreline.

(38) In some embodiments, the support product **10** comprises a polymer. The support product **10** may be constructed of polymer. The support product **10** may be a constructed of a composite material comprising a polymer.

(39) Repeated Cell Structure

(40) At least some of the plurality of walls **20** define at least part of the cells **26**. The cells **26** are configured to receive the fill material. Each cell **26** may be said to have a three-dimensional shape. The three-dimensional shape of a cell **26** corresponds to the three-dimensional volume of the cell **26**, as defined at least partly by the relevant walls **20**. Each cell **26** may also be said to have a planar profile **39**. The planar profile **39** of a cell **26** may be referred to as a cell planar profile. The planar profile **39** of a cell **26** is the profile of the cell **26**, when viewed from a plan view (i.e. from above, as shown in FIG. **2**). The planar profile **39** of a cell **26** may be a function of the height of the cell **26**. That is, as the height of the cell is transited (e.g. from the base end **31** to the elevated end **33**, the planar profile **39** of the cell may vary (e.g. with varying thickness of the walls **20** defining the cell **26**).

(41) As described herein, one or more of the walls **20** of the plurality of walls **20** of the support structure **10** meets another wall **20** of the plurality of walls **20** at a junction **28**. The junctions **28** can be used as reference points to define a planar shape of the cells **26**. Specifically, a cell perimeter profile **38** can be determined by connecting the junctions **28** of a respective cell **26** with straight lines. The cell perimeter profiles **38** described herein are determined by connecting the junctions **28** of the cells **26** at the elevated end **33** of the walls **20**. It will be understood however, that the cell perimeter profiles **28** may be determined in a similar way at a different elevation (e.g. at a point between the base end **31** and the elevated end **33** of the walls).

(42) In the illustrated embodiment, the perimeter profiles **38** of the cells **26** are quadrilateral. It will be understood that in some embodiments, one or more of the cells **26** may have a perimeter profile

38 that is not a quadrilateral. For example, the perimeter profile **38** may be another polygonal profile (e.g. triangular or hexagonal). In some embodiments, the perimeter profile **38** may be an asymmetric polygon.

(43) Each cell **26** has a respective cell planar profile **39**. The cell planar profile **39** of a particular cell **26** is the profile defined by the surfaces of the walls **20** that define that cell **26**. Such wall **20** surfaces may be referred to as 'inner surfaces' with respect to the particular cell **26**. One or more of the cells **26** has a quadrilateral cell planar profile **39**. In particular, one or more of the cells **26** has a cell planar profile **39** resembling a rhombus.

(44) It will be understood that geometric terms such as 'polygon', 'quadrilateral' and 'rhombus' used herein are intended to be generally indicative of a particular geometry, without excluding other similar geometries. For example, where the term quadrilateral is used herein, it will be understood that the relevant quadrilateral geometry does not necessarily need precisely defined corners to fall within the scope of the term quadrilateral. That is, the term quadrilateral herein is intended to include rounded quadrilaterals (i.e. quadrilaterals with rounded corners) and other minor variations to the specific geometric definition of a quadrilateral as being a shape with 4 straight sides and 4 corners. For example, referring to cell **26**B of FIG. **4**, it can be seen that the planar profile of the cell includes 4 straight edges, 3 rounded corner regions and a corner region that is defined in part by a wall **20** defining a circular junction **28**. Herein, shapes such as this will be described as quadrilateral, or as a polygon, as their prominent features resemble that of a quadrilateral and/or a polygon (i.e. 4 straight edges), even if such shapes do not necessarily meet the strict mathematical definition of a quadrilateral and/or polygon requiring a number precisely defined corners.

(45) Referring to FIGS. **2** and **4**, a number of the walls **20** of the support structure **10** define a cell structure **36**. The cell structure **36** comprises a plurality of cells **26**. The cell structure **36** is repeated throughout at least part of the support product **10**. In the illustrated embodiment, the cell structure **36** is repeated throughout the support product **10**, with one instance of the cell structure **36** being immediately adjacent to a number of other instances of the cell structure **36**. The adjacent cell structures **36** share a number of common walls **20**. In other words, one particular wall **20** defines part of a cell **26** in one cell structure **36** and part of a cell **26** in an adjacent cell structure **36**. That is, in some embodiments, each instance of the cell structure **36** shares at least one wall **20** in common with another instance of the cell structure **36**.

(46) The junctions **28** can also be used as reference points to define a planar shape of the cell structure **36**. Specifically, a perimeter profile **38** of the cell structure **36** can be determined by connecting the junctions **28** of the cell structure **36** that fall on the perimeter of the cell structure **36** with straight lines (for example, as shown for one group of cells **26** forming a cell structure **36** in FIG. **2**). In the illustrated embodiment, the perimeter profile **38** of the cell structure **36** forms an asymmetric polygon.

(47) One or more of the cells **26** of the cell structure **36** is a quadrilateral. In other words, the cell perimeter profile **38** and/or the cell planar profile of one or more of the cells **26** of the cell structure **36** is a quadrilateral. In the illustrated embodiment, each of the cells **26** of the cell structure **36** is a quadrilateral. That is, the cell perimeter profile **28** and the cell planar profile of each of the cells **26** of the cell structure **36** is a quadrilateral.

(48) One or more of the cells **26** of the cell structure **36** is symmetrical. One or more of the cells **26** of the cell structure **36** is regular. That is, each side of one or more of the cells **26** is of equal length.

(49) Referring to FIG. **4**, the cell structure **36** comprises a first cell **26**A. The first cell **26**A is a first shape. The first shape is defined, at least in part, by a first subset of the plurality of walls **20**. The first subset of the plurality of walls **20** comprises a number of walls **20**. The cell structure comprises a second cell **26**B. The second cell is a second shape. The second shape is defined, at least in part, by a second subset of the plurality of walls **20**. The second subset of the plurality of walls **20** comprises a number of walls **20**.

(50) The first cell **26**A and the second cell **26**B share at least one wall **20**. That is, at least one of the walls **20** defines part of the first cell **26**A and part of the second cell **26**B. In other words, the second subset of the plurality of walls **20** comprises at least one wall **20** of the first subset.
(51) The cell structure **36** comprises a first group of cells **44**. The first group of cells **44** comprises the first cell **26**A and the second cell **26**B. The first cell **26**A and the second cell **26**B are symmetrical about a first axis of symmetry. In other words, the first group of cells **44** comprises the first axis of symmetry and the first shape mirrors the second shape about the first axis of symmetry. The first axis of symmetry is parallel to the longitudinal axis of the wall **20** that is shared by the first cell **26**A and the second cell **26**B. In particular, the first axis of symmetry extends along at least part of a wall **20** that is shared by the first cell **26**A and the second cell **26**B.
(52) The cell structure **36** comprises a third cell **26**C. The third cell is a third shape. The third shape is defined, at least in part, by a third subset of the plurality of walls **20**. The third subset of the plurality of walls **20** comprises at least one wall **20** from the first subset. The third subset of the plurality of walls **20** comprises at least one wall **20** from the second subset. In the illustrated embodiment, the third subset comprises one wall **20** from the second subset and one wall **20** from the first subset. That is, the third cell **26**C and the first cell **26**A share a wall **20**. Similarly, the third cell **26**C and the second cell **26**B share a wall **20**.
(53) The cell structure **36** comprises a fourth cell **26**D. The fourth cell **26**D is a fourth shape. The fourth shape is defined, at least in part, by a fourth subset of the plurality of walls **20**. The fourth subset of the plurality of walls **20** comprises a number of walls **20**. The cell structure comprises a fifth cell **26**E. The fifth cell **26**E is a fifth shape. The fifth shape is defined, at least in part, by a fifth subset of the plurality of walls **20**. The fifth subset of the plurality of walls **20** comprises a number of walls **20**.
(54) The fourth cell **26**D and the fifth cell **26**E share at least one wall **20**. That is, at least one of the walls **20** defines part of the fourth cell **26**D and part of the fifth cell **26**E. In other words, the second subset of the plurality of walls **20** comprises at least one wall **20** of the first subset.
(55) The third subset of the plurality of walls **20** comprises at least one wall **20** from the fourth subset. The third subset of the plurality of walls **20** comprises at least one wall **20** from the fifth subset. In the illustrated embodiment, the third subset comprises one wall from the fourth subset and one wall from the fifth subset.
(56) The cell structure **36** comprises a second group of cells **46**. The second group of cells **46** comprises the fourth cell **26**D and the fifth cell **26**E. The fourth cell **26**D and the fifth cell **26**E are symmetrical about a second axis of symmetry. In other words, the second group of cells **46** comprises the second axis of symmetry and the fourth shape mirrors the fifth shape about the second axis of symmetry. The second axis of symmetry is parallel to the longitudinal axis of the wall **20** that is shared by the fourth cell **26**D and the fifth cell **26**E. In particular, the second axis of symmetry extends along at least part of a wall **20** that is shared by the fourth cell **26**D and the fifth cell **26**E.
(57) The first group of cells **44** and the second group of cells **46** are symmetrical about a third axis of symmetry. That is, the first group of cells **44** mirror the second group of cells **46** with respect to the third axis of symmetry. The third axis of symmetry bisects the third cell **26**C.
(58) The walls **20** that define the first through fifth cells **26**A-E together form a hexagonal wall profile. In particular, the hexagonal wall profile is an elongated hexagon. This wall **20** and/or cell **26** configuration can improve the performance of the support product **10** under compressive loads.
(59) The cell structure **36** comprises a sixth cell **26**F. The sixth cell **26**F is a sixth shape. The sixth shape is defined, at least in part, by a sixth subset of the plurality of walls **20**. The sixth subset of the plurality of walls **20** comprises at least one wall **20** from the fifth subset. In the illustrated embodiment, the sixth subset comprises one wall **20** from the fifth subset. That is, the fifth cell **26**E and the sixth cell **26**F share a wall **20**.
(60) It will be understood that the ‘shape’ of a cell **26**A-F of the cell structure **36** described herein

may refer to one or more of the three-dimensional shape, cell perimeter profile **28** and the cell planar profile of the relevant cell **26**A-F. When referring to the three-dimensional shape, one or more of the first shape, second shape, third shape, fourth shape, fifth shape and sixth shape may be a rhombic prism. When referring to the cell perimeter profile or the cell planar profile, one or more of the first shape, second shape, third shape, fourth shape, fifth shape and sixth shape may be a rhombus.

(61) Partial Keyway

(62) The support product **10** comprises a partial keyway **50**. The partial keyway **50** defines a re-entrant corner of the support product **10**. The partial keyway **50** is configured to receive part of a key (not shown). The partial keyway **50** extends inwardly from an edge of the support product **10**. In other words, the partial keyway **50** extends inwardly from one of the minor faces **63**, **65**, **67**, **69** of the support product **10**. The edge (which may be part of one of the edge regions **62**, **64**, **66**, **68**) may, in some embodiments, be said to comprise the partial keyway **50**.

(63) The partial keyway **50** is configured to inhibit outward motion of the key when the key is within the partial keyway. In other words, the partial keyway **50** is configured to inhibit movement of the key away from the support product **10** once the key is received within the partial keyway **50**.

(64) The partial keyway **50** is configured to be located adjacent to a partial keyway **50** of another support product **10** that is connected to the described support product **10**, so that adjacent partial keyways **50** define a complete keyway **55** between connected support products **10**. Partial keyways **50** of adjacent support products **10** may define a complete keyway **55** having a chevron shaped section.

(65) The support product **10** comprises an edge wall **54**. In particular, the plurality of walls **20** comprises the edge wall **54**. The edge wall **54** defines an edge plane. The edge plane is parallel to the edge wall **54**. In some embodiments, the edge plane is disposed at the relevant minor face **63**, **65**, **67**, **69** and is parallel to that minor face **63**, **65**, **67**, **69**.

(66) The partial keyway **50** is defined, at least in part, by some of the plurality of walls **20**. The walls **20** that define the partial keyway **50** may be referred to as partial keyway walls **52**. The support product **10** may therefore be said to comprise a plurality of partial keyway walls **52**. The plurality of partial keyway walls **52** comprises a pair of offset partial keyway walls **56**, **58**. The pair of offset partial keyway walls **56**, **58** comprises a first partial keyway wall **56** and a second partial keyway wall **58**. The first partial keyway wall **56** is parallel to the second partial keyway wall **58**. The first partial keyway wall **56** is offset from the second partial keyway wall **58** so that the first partial keyway wall **56** and the second partial keyway wall **58** are separated by a separation distance. The pair of offset partial keyway walls **56**, **58** extend parallel to a first direction **57**. The first direction **57** is transverse to the edge plane. That is, the first direction **57** and the edge plane are non-parallel.

(67) The plurality of partial keyway walls **50** comprises a transverse partial keyway wall **70**. The transverse partial keyway wall **70** extends between the pair of opposed partial keyway walls **56**, **58**. In other words, the transverse partial keyway wall **70** extends from one of the pair of offset partial keyway walls **56**, **58** to the other of the pair of offset partial keyway walls **56**, **58**.

(68) The first partial keyway wall **56** meets the edge wall **54** at a junction **28**. This junction **28** may be referred to as a first junction. The first partial keyway wall **56** and the edge wall **54** define an acute angle at the first junction. At its other end, the first partial keyway wall **56** meets the transverse partial keyway wall **70** at a junction **28**. This junction **28** may be referred to as a second junction. The first partial keyway wall **56** extends from the first junction to the second junction. The first partial keyway wall **56** and the transverse partial keyway wall **70** define an acute angle at the second junction.

(69) The transverse partial keyway wall **70** meets the second partial keyway wall **58** at a junction **28**. This junction **28** may be referred to as a third junction. The transverse partial keyway wall **70** extends from the second junction to the third junction. The transverse partial keyway wall **70** and

the second partial keyway wall **58** define an obtuse angle at the third junction.
(70) The second partial keyway wall **58** extends from the third junction to a wall end portion **72**. In the embodiment illustrated in FIG. **3**, the wall end portion **72** is a junction between the second partial keyway wall **58** and another edge wall. The second partial keyway wall **58** is longer than the first partial keyway wall **56**. In the illustrated embodiment, the length of the second partial keyway wall **58** is double the length of the first partial keyway wall **56**.
(71) The second partial keyway wall **58** and the first partial keyway wall **56** define a keyway opening **76**. In particular, the keyway opening **76** is defined by the first junction and the wall end portion **72** (which, in the illustrated case, is the junction between the second partial keyway wall **58** and the adjacent edge wall). The keyway opening **76** can be considered to be an opening in the edge region of the support product **10**.
(72) The illustrated support product **10** comprises a plurality of partial keyways **50**. Each edge region **62**, **64**, **66**, **68** comprises at least one partial keyway **50**. In the illustrated embodiment, the first edge region **62** and the second edge region **66** each comprise ten partial keyways **50** and the second edge region **64** and the fourth edge region **68** each comprise four partial keyways **50**.
(73) In some embodiments, the first partial keyway wall **56** and the second partial keyway wall **58** may be non-parallel. For example, the first partial keyway wall **56** and the second partial keyway wall **58** may extend, with respect to each other, such that an angle is formed at an intersection of lines tangential each of the walls **56**, **58**. That is, the angle formed between a line extending along the first partial keyway wall **56** parallel to its longitudinal axis **21** may extend beyond the first partial keyway wall **56** and intersect a similar line extending along the second partial keyway wall **58** at an angle. The angle may be an acute angle. The angle may be a right angle. The angle may be an obtuse angle.
(74) It will also be understood that although the first partial keyway wall **56** is shown as connected to the edge wall **54** at a junction **28**, this may not necessarily be the case. In some embodiments, the first partial keyway wall **56** and/or the second partial keyway **58** wall may terminate at a free end. Alternatively, the first partial keyway wall **56** and/or the second partial keyway **58** may terminate at a junction with a wall that is non-parallel to the relevant minor face of the support product **10**.
(75) Planar Portion
(76) The support product **10** comprises a planar portion **80**. The planar portion **80** is generally planar. That is, the planar portion **80** is generally parallel to the axes of a reference plane. The reference plane is parallel to one of the major faces **14**, **16** of the support product **10**. In some embodiments, one of the major faces **14**, **16** lies on the reference plane.
(77) The planar portion **80** has a thickness in a direction that is generally perpendicular to the axes of the reference plane. The planar portion **80** extends, in the direction that is generally perpendicular to the axes of the reference plane, from a first planar portion face **82** to a second planar portion face **84** (see FIG. **6**). The first planar portion face **82** may be referred to as a lower face of the planar portion **80**. The second planar portion face **84** may be referred to as an upper face of the planar portion **80**. One or both of the first planar portion face **82** and the second planar portion face **84** are generally parallel to the reference plane.
(78) The planar portion **80** comprises a channel **86**. The channel **86** extends from the first planar portion face **82** to the second planar portion face **84** to define a path through which fluid can flow through the planar portion **80**. The channel **86** is aligned with a cell **26** to provide a path through which fluid can flow through the support product **10**. The illustrated planar portion **80** comprises a plurality of channels **86**, each aligned with a respective cell **26**. Each channel **86** and cell **26** together provide a hole through the support product **10**.
(79) In some embodiments, the planar portion **80** may be considered to be part of the plurality of walls **20**. That is, the walls **20** may be considered to have a thicker portion at their base end **31**, with the thicker portion comprising the planar portion **80**. When described in this way, it will be understood that the walls **20** may be considered to be thicker at a lower portion than at a higher

portion.
(80) In some embodiments, rather than the planar portion **80** being considered to be part of the walls **20**, the walls **20** may be considered to be connected to the planar portion **80**.
(81) In some embodiments, the walls **20** are integrally formed with the planar portion **80**. For example, the walls **20** and the planar portion **80** may be formed in an injection moulding process such that the walls **20** and the planar portion **80** form an integrated structure. The walls **20** project from the planar portion **80**. In other words, the walls **20** extend away from the planar portion **80**. As described herein, each of the walls **20** extends from a base end to an elevated end **33**. The walls **20** are adjacent to the planar portion **80** at their base end **31**. The elevated end **33** of a particular wall **20** is further away from the planer portion **80** than the base end **31** of that wall **20**. The elevated ends **33** of the walls **20** define an elevated surface **43**. The elevated surface **43** faces away from the planar portion **80**.
(82) Access Cell
(83) The support product **10** comprises an access cell **60**. The access cell **60** is generally cylindrical. In other words, a cross-sectional profile of the access cell **60** is circular. The access cell **60** may therefore be referred to as a cylindrical access cell **60**. The access cell **60** is defined by a wall **20** of the support product.
(84) The access cell **60** is configured to facilitate access below the support product **10**. In particular, the access cell **60** is configured to enable access beneath the support product **10** once installed. The access cell **60** extends from the first major face **14** of the support product **10** to the second major face **16** of the support product **10**. The access cell **60** is defined by a cylindrical wall **20**. The access cell **60** is disposed at a junction **28** of the support product **10**. In particular, the access cell **60** is disposed at a junction between the first group of cells **44**, the second group of cells **46** and the third call **26**C of the cell structure **36**. In other words, a junction **28** between a number of the walls **20** of the plurality of walls **20** comprises the access cell **60**.
(85) The access cell **60** is configured to contain the fill material. The fill material may be removed if access underneath a section of pavement constructed using the support product **10** is required. For example, where the fill material is concrete, the concrete contained within the access cell **60** during use can be removed (e.g. with a drill), creating a channel through which a space underneath the support product **10** can be accessed. After the need to access underneath the support product is remediated, the access cell **60** can again be filled with the relevant fill material and the pavement can continue to be used.
(86) The cylindrical access cell **60** may comprise protrusions into the cell to retain the hardened concrete cylinder and prevent it from being accidentally ejected. The illustrated access cell **60** comprises a plurality of inwardly projecting projections.
(87) The illustrated support product **10** comprises a plurality of access cells **60**.
(88) Connecting Multiple Support Products
(89) The support product **10** is configured to be connected to one or more other support products **10** during the construction of a path. Herein, a path may be considered to comprise one or more of a pavement and a granular track configured to enable the movement of vehicles or people. The support product **10** comprises a connection system **45** to facilitate this connection. The connection system **45** may comprise one part of a first support product **10** and another part of a second support product **10**, with the parts of the respective support products **10** cooperating to enable the connection of the support products **10**. This connection of the support products **10** may be referred to as a first connection. It may also be referred to as an initial connection of the support products **10**. This connection is configured to enable the support products **10** to be aligned in a way that facilitates the construction of a second connection (which can involve the fill material and/or a key). When the support products **10** are connected using the connection system(s) **45**, a number of the partial keyways **50** of the first support product **10** are aligned with the partial keyways **50** of the second support product **10**, forming complete keyways **55**.

(90) The support product **10** comprises a catch **40**. In particular, the connection system **45** may comprise the catch **40**. The catch **40** is configured to connect with a catch **40** of an adjacent support product **10** to restrain relative movement of connected support products **10**.
(91) Each edge may comprise at least one catch **40** and at least one partial keyway **50**, wherein partial keyways **50** of opposed edges are symmetrical.
(92) In other words, each edge region **62**, **64**, **66**, **68** comprises at least one catch **40**. Each edge region **62**, **64**, **66**, **68** also comprises at least one partial keyway **50**.
(93) Each edge may comprise at least two partial keyways **50**. Each edge region **62**, **64**, **66**, **68** may comprise at least two partial keyways **50**.
(94) Each edge may comprise at least four partial keyways **50**. Each edge region **62**, **64**, **66**, **68** may comprise at least four partial keyways **50**.
(95) Each edge may comprise at least two catches **40**. Each edge region **62**, **64**, **66**, **68** may comprise at least four catches **40**.
(96) Each edge may comprise at least four catches **40**. Each edge region **62**, **64**, **66**, **68** may comprise at least four catches **40**.
(97) Each catch **40** may be either a first part or a second part.
(98) The first part may be a male pin and the second part may be a female slot.
(99) In some embodiments, the catch **40** comprises an outer catch portion **41** (see FIG. **3**). The outer catch portion **41** has a first width. The catch **40** comprises an inner catch portion **48**. The inner catch portion **48** has a second width. The first width is greater than the second width. Such a catch **40** may be referred to as a male catch. The male catch projects outwardly from one of the minor faces of the support product **10**.
(100) In some embodiments, the catch **40** comprises a groove. The groove is a groove in one of the walls **20** of the support product. For example, the edge wall **24** may comprise the groove. The groove is configured to receive a male catch.
(101) The illustrated embodiment of the support product **10** comprises a plurality of male catches and a plurality of female catches. The plurality of male catches project outwardly from one or more walls **20** of an edge region **62**, **64**, **66**, **68**. The plurality of female catches are located on one or more walls of an edge region **62**, **64**, **66**, **68** that is adjacent to the edge region **62**, **64**, **66**, **68** from which the plurality of male catches project outwardly. In some embodiments, a pair of opposed edge regions **62**, **64**, **66**, **68** comprise male catches and another pair of opposed edge regions **62**, **64**, **66**, **68** comprise female catches.
(102) In another embodiment, the first part may be an over hook and the second part may be an under hook.
(103) A pair of adjacent edges of the support product **10** may comprise catches **40** having a first part, and an opposed pair of adjacent edges of the support product **10** may comprise catches **40** having a second part, to facilitate assembly of a large number of support products **10**.
(104) In another embodiment, each catch **40** is comprised of a slot, and support products are connected using an intermediary connector **42**.
(105) The intermediary connector **42** may be cotton reel shaped, having wider ends and a narrower mid-portion.
(106) As described herein, multiple support products **10** are connected together using the connection systems **45** provided on each support product **10**. Partial keyways **50** of adjacent support products **10** may define a complete keyway **55** having a shape configured to prevent separation of adjacent support products **10**.
(107) After the support products **10** are connected using the connection systems **45** of the multiple support products (e.g. with one support product **10** including a male catch that is aligned with, and connected to a female catch of another support product **10**), the fill material can be provided. Multiple connected support products **10** are shown, by way of example, in FIG. **8**.
(108) In some embodiments, the fill material comprises a cementitious material. In such

embodiments, the fill material can be poured onto the support product **10** so that it fills the cells **26** and the complete keyways **55**. Once the cementitious material cures, the hardened cementitious material within a complete keyway **55** will act as a key that inhibits relative movement of the connected support products **10**.

(109) In some embodiments, the fill material can be a granular fill material such as gravel. In such embodiments, a key can be inserted into one or more of the complete keyways **55** formed when the multiple support products **10** are connected together using the relevant connection systems **45**. The key may be a metal part, a ceramic part, a concrete part, or a part comprising another material. The key is shaped to be received within a complete keyway **55**. Once the keys are inserted, the fill material can be provided, and the cells **26** can be filled with the fill material. In this case, the keys can inhibit relative movement of the connected support products in use.

(110) Pavement Course

(111) Referring to FIGS. **6** to **8** there is provided a pavement course according to an embodiment of the present disclosure, the pavement course comprising a plurality of connected support products **10**, wherein each support product **10** comprises; a latticework of walls **20** and a plurality of edges **30**, wherein the walls **20** extend between a lower surface **22** and an upper surface **24** and define a plurality of cells **26**, wherein at least one edge comprises a catch **40** and a partial keyway **50**, wherein adjacent support products **10** are connected by respective catches **40** to restrain relative movement, and wherein the partial keyway **50** is located adjacent to a partial keyway **50** of a connected support product **10**, so that adjacent partial keyways **50** define a complete keyway **55** between connected support products **10**, and wherein the pavement course comprises concrete extending from the lower surface **22** to the upper surface **24** so that the cells **26** and keyways **55** are substantially filled with concrete.

(112) In other words, the support product **10** described herein may be used in the construction of a path. The path may be referred to as a pavement course. The path comprises a plurality support products **10** that are connected together at their respective edge regions **62**, **64**, **66**, **68**. The connected support products **10** are filled with a fill material, and, if required, one or more keys, to form the path.

(113) The pavement course may further comprise an edge formwork piece **32**. The edge formwork piece **32** is configured to connect to catches **40** of the support products **10** at the edges of the pavement course. The edge formwork piece **32** defines an edge of the pavement course.

(114) In one embedment, the edge formwork piece **32** may be constructed of a constant section, having a slot configured to receive an intermediary connector **42**.

(115) In another embodiment, the edge formwork piece **32** may comprise catches configured to connect with catches **40** of the support product **10**.

(116) The fill material may be provided to the connected support products **10** after the connection of the necessary edge formwork pieces **32** to the edge regions of the support products **10** forming edges of the path.

(117) Method of Constructing a Pavement Course

(118) In accordance with another aspect of the present disclosure there is provided a method of constructing a pavement course. As described herein, the pavement course may be, more generally, described as a path. The pavement course comprises a plurality of connected support products **10**. Each support product **10** comprises a latticework of walls **20** and a plurality of edges **30**. The walls **20** extend between a lower surface and an upper surface and define a plurality of cells **26**. At least one edge **30** comprises a catch **40** and a partial keyway **50**. Each partial keyway **50** is configured to be located adjacent to a partial keyway **50** of a connected support product **10**, so that adjacent partial keyways **50** define a complete keyway **55** between connected support products **10**.

(119) The method comprises one or more of the following steps: a. Connecting a plurality of support products **10** using adjacent catches **40**, to create an array **12** substantially spanning an area for which the pavement course is to be provided, b. Pouring concrete onto the array **12**, so that the

cells **26** and complete keyways **55** of the array **12** of support products **10** are substantially filled with concrete, c. Allowing the concrete to set.
(120) The method may comprise the following step after step b: b. Levelling the upper surface using a vibrating screed.
(121) The method may comprise the following step after step c: c. once the concrete has hardened, finishing the upper surface using a chopper.
(122) Described differently, the method comprises connecting a plurality of the support products **10**. The relevant connection systems **45** may be used, as described herein. The support products **10** may be connected to form an array **12** of support products **10**.
(123) As described herein, the support product **10** is configured to be aligned with a second support product **10** such that the partial keyway **50** of the support product **10** and a partial keyway of the second support product **10** form a complete keyway **55**. The complete keyway **55** may be referred to as a keyway. The keyway is configured to receive a key. In use, the partial keyway walls **52** are configured to cooperate with the key to inhibit relative movement of the support product **10** and the second support product **10**, as described herein. This is, at least in part, as the partial keyway **50** extends inwardly from an edge of the support product **10**.
(124) In use, a plurality of support products **10** are located adjacent one another and connected using the catches **40** on their respective edges **30**.
(125) The connected support products **10** create an array **12**. The array **12** may be said to have latticework walls **20** extending across the area designated for the pavement course **100**. The array of support products **10** may cover an area over which it is desired to form a path.
(126) The support products **10** may be laid upon subgrade, sub-base or base course, and may therefore be able to substitute different courses.
(127) The base course may further have cracker dust, also known also crusher dust, applied and compacted, before the support products **10** are laid.
(128) Where edges of the area do not align with edges **30** of the support products **10**, support products **10** may be cut to suit.
(129) Edge formwork **32** pieces may be connected to support products **10**, thus providing integrated formwork and removing the requirement for conventional formwork.
(130) The method comprises providing a fill material to the support products **10**. The fill material is provided so that its received within the cells **26** (and where relevant, the complete keyways **55**). As described herein, if the fill material is not to be used as a key, separate keys can be included in the complete keyways **55** prior to providing the fill material.
(131) If the fill material requires curing, the method can comprise allowing the fill material to cure after being received within the cells **26**.
(132) In some embodiments, the method comprises levelling the path using a vibrating screed. In other words, the connected support products **10**, which are filled **3** with a concrete mix, may be levelled at the upper surface using a vibrating screed. Further, an upper surface of the path may be finished. The upper surface may be finished using a chopper. In other words, once hardened, the concrete of the embodiments involving concrete may be finished using a chopper.
(133) Method of Repairing a Pavement Course
(134) In accordance with another aspect of the present disclosure there is provided a method of repairing a void in a pavement course. The pavement course comprises a plurality of connected support products **10**. Each support product **10** comprises; a latticework of walls **20**, a cylindrical access cell **60** and a plurality of edges. The walls **20** extend between a lower surface and an upper surface and define a plurality of cells **26**. At least one edge **30** comprises a catch **40** and a partial keyway **50**. Adjacent support products **10** are connected by respective catches **40** to restrain relative movement. The partial keyway **50** is located adjacent to a partial keyway **50** of a connected support product **10**, so that adjacent partial keyways **50** define a complete keyway **55** between connected support products **10**. The pavement course comprises concrete extending from the lower surface to

the upper surface. The cells **26** and keyways **55** are substantially filled with concrete. The method comprises the following steps: d. Drilling through the concrete of a cylindrical access cell **60**, wherein the cylindrical access cell **60** is located above the void **110** to be repaired, e. Injecting filler product into the void **110** until the void **110** and the cylindrical access cell **60** are substantially filled.

(135) In other words, where a path constructed using the support product **10** described herein is experiencing degradation, for example, by way of a void developing under the section of the path that comprises the support product **10**, the support product **10** enables the path to be repaired. The path can be repaired using a method, as described herein.

(136) Specifically, the fill material contained within the access cell **60** can be removed. This can be done, for example, with a drill. The access cell **60** will provide a path underneath the relevant support product following removal of the fill material. A filler product can then be injected into the void that has developed under the path. The **33** filler product can be injected to fill the void. Once the void is filled, new fill material can be provided into the access cell **60** to return the path to an operational state. This method, and the provision of the access cell **60**, enable the path to be repaired inexpensively, and without significant structural disruption to the rest of the path.

(137) Advantages

(138) The support product **10** described herein provides a number of significant advantages.

(139) Existing flexible pavements require a significant volume of material and excavated depth. Higher material volumes and exaction depths result in associated increased costs of construction. Damage to flexible pavements is also common.

(140) Rigid pavements are adversely affected by temperature changes, which can cause expansion and subsequent cracking of the rigid pavements. Rigid pavements can also be relatively expensive to construct and difficult to repair.

(141) The support product **10** described herein can enable the construction of a path such as a pavement for the conveyance of traffic that provides benefits that are typically only provided by one of flexible pavements or rigid pavements.

(142) The inclusion of the support product **10** enables the path which is ultimately constructed using the support product **10** to flex, as the support product **10** is generally less rigid than a concrete or steel re-enforced concrete path. As the cells **26** of the support product **10** are filled with fill material, the compressive strength of the fill material can be utilised in use, whilst the flexibility of the support product **10** enables the path to flex when under load. A path constructed using the support product **10** can therefore provide benefits that are traditionally provided by only one of flexible pavements and rigid pavements. That is, a path constructed using the support product **10** can provide the benefits of a rigid pavement (e.g. where the fill material is concrete), whilst also providing the benefits of a flexible pavement, at least in part due to the flexibility provided by the support product **10** and the way the support product **10** divides the path into cells **26** of rigid fill material. Such characteristics can reduce the wear experienced by the path over time, and can lead to an increase in the working lifespan of a path constructed using the support product **10**.

(143) The support product **10** enables the construction of a path that can support a high load whilst sustaining a reduced amount of damage. For example, a path **3** constructed using an array of connected support products **10**, in combination with concrete as a fill material, can provide sufficient structural integrity for a concrete truck to drive across without disturbing the subjacent base courses.

(144) The construction of such a path using conventional methods could require a significant volume of concrete. The described support product **10**, and the described method of constructing a path using the support product **10** therefore remove or reduce the requirement for an expensive concrete pump in some instances, for example on a large expanse of pavement area.

(145) Further, a composite pavement course constructed as described herein, comprised of support products **10** filled with a fill material, can achieve a large tensile load bearing capacity, when

compared to known conventional flexible and rigid pavement courses.
(146) A pavement course of support products **10** having a thickness of 40 mm between the upper surface and lower surface, filled with a 32 MPa rated concrete mix, has been shown to have compressive strength of 107 MPa without cracking. Thus, high strength paths of reduced thickness can be constructed using the support product **10** and an appropriate fill material. The pavement course constructed using support products **10** according to the present disclosure therefore requires less concrete per unit area of the path, due to the reduced thickness.
(147) In other words, the support product **10** described herein enables the construction of paths with a relatively small vertical profile (i.e. depth, and therefore, corresponding excavation requirements), that are capable of supporting the transport of heavy vehicles. Such paths can be constructed using a reduced amount of materials, which can significantly reduce the cost of producing such a path, and the logistical difficulties associated with constructing such paths.
(148) The openings **34** of the support product **10** advantageously enable fill material to flow between cells **26** during construction. This enables the fill material to settle at a relatively constant height throughout the path that is being constructed.
(149) No formwork or additional concrete reinforcement is required, saving both time and cost.
(150) In the example detailed above with an illustration of the compressive strength of a pavement course constructed using the support product, the concrete required is approximately 0.04 m3 per square metre, significantly less than either a conventional rigid pavement or flexible pavement. Further, the reduced thickness of the pavement course requires less excavation and material than conventional pavements. Less excavation means less expensive heavy machinery, lower risk of hitting or disrupting underground services, and reduced schedules.
(151) The load profile of a pavement course according to the present disclosure is similar to a rigid pavement, as depicted in FIG. **1***c*, with the load being spread due to the tensile stress being carried through the support product filled with concrete.
(152) As such, any defects or voids beneath the pavement course **10** are shallower than would be experienced by flexible pavements.
(153) In addition, due to higher tensile strength, the pavement course **100** has a greater loading capacity and may continue to operate with a defect below the pavement course **100**, for a longer period without failure which requires repair, than conventional pavements.
(154) In the event of a void appearing under the pavement course **100**, access beneath the pavement course **100** can be provided by removing a single cell of concrete, and injecting a suitable filler product to fill the void. Further, prior to repair, the flexibility of the support product **10** enables the path to flex to partially accommodate the void. This can reduce damage to the composite pavement (i.e. the support product filled with fill material) caused by damage underneath the pavement.
(155) Once cured, the pavement constructed using support products **10** according to the present disclosure is comprised of a plurality of cured concrete cells **26** and keyways interconnected by the support product **10**.
(156) The combination provides structural integrity significantly exceeding conventional pavements at lower thickness.
(157) Importantly, the partial keyways **50** between each support product **10** allow concrete keys to form across connecting edges, so that connected support products **10** are restrained.
(158) This removes the requirement for conventional ties or steel dowels, and allows the construction of a concrete pavement course with no movement or expansion joints required.
(159) The term concrete, as used throughout the specification, is intended in an inclusive sense to include any cementitious or bituminous product. The term concrete is also intended to include
(160) Modifications and variations as would be apparent to a skilled addressee are deemed to be within the scope of the present disclosure.
(161) In the claims which follow and in the preceding description, except where the context requires otherwise due to express language or necessary implication, the word “comprise” or

variations such as “comprises” or “comprising” is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the disclosure.

Claims

1. A support product for receiving a fill material in construction of a path, the support product comprising: a plurality of walls, at least some of the plurality of walls defining cells, the plurality of walls comprising: an edge wall defining an edge plane that is parallel to the edge wall; and a plurality of partial keyway walls defining a partial keyway, the plurality of partial keyway walls comprising: a pair of offset partial keyway walls that extend parallel to a first direction that is transverse to the edge plane, the pair of offset partial keyway walls comprising: a first partial keyway wall; and a second partial keyway wall; and a transverse partial keyway wall extending from one of the pair of offset partial keyway walls to the other of the pair of offset partial keyway walls; wherein: the first partial keyway wall meets the edge wall at a first junction; the first partial keyway wall and the edge wall define an acute angle at the first junction; and the support product is configured to be aligned with a second support product such that the partial keyway and a second partial keyway of the second support product form a keyway configured to receive a key.
2. The support product of claim 1, wherein the support product is part of a path.
3. The support product of claim 1, wherein the first partial keyway wall and the transverse partial keyway wall define an acute angle therebetween.
4. The support product of claim 1, wherein the transverse partial keyway wall and the second partial keyway wall define an obtuse angle therebetween.
5. The support product of claim 1, wherein the second partial keyway wall is longer than the first partial keyway wall.
6. The support product of claim 1, wherein the partial keyway defines a re-entrant corner of the support product.
7. The support product of claim 1, further comprising a male catch that projects outwardly, the male catch comprising: an outer catch portion of a first width; and an inner catch portion of a second width; wherein the first width is greater than the second width.
8. The support product of claim 1, further comprising a female catch in the form of a groove in one of the walls of the plurality of walls.
9. The support product of claim 1, wherein the support product comprises: opposed major faces comprising a first major face and a second major face; and a plurality of edge regions; wherein each edge region comprises a respective minor face of the support product and one of the edge regions comprises the partial keyway.
10. The support product of claim 1, further comprising a polymer.
11. The support product of claim 1, wherein: the first partial keyway wall extends from the first junction to a second junction, the second junction being a junction between the first partial keyway wall and the transverse partial keyway wall; and the second partial keyway wall extends from a third junction to a wall end portion, the third junction being a junction between the transverse partial keyway wall and the second partial keyway wall; wherein a keyway opening is defined between the first junction and the wall end portion.
12. The support product of claim 11, wherein the wall end portion is a junction between the second partial keyway wall and another edge wall.
13. The support product of claim 1, wherein the plurality of walls defines a cell structure, the cell structure being repeated throughout at least part of the support product; wherein: each wall of the plurality of walls meets another wall of the plurality of walls at a junction; and a perimeter profile of the cell structure determined by connecting junctions with straight lines forms an asymmetric polygon.

14. The support product of claim 13, wherein each instance of the cell structure shares at least one wall in common with another instance of the cell structure.
15. The support product of claim 1, further comprising an access cell that is configured to enable access beneath the support product.
16. The support product of claim 15, wherein a junction between a number of the walls of the plurality of walls comprises the access cell.
17. The support product of claim 15, wherein a cross-sectional profile of the access cell is circular.
18. The support product of claim 15, wherein the access cell comprises inwardly projecting projections.
19. The support product of claim 1, wherein the support product is part of a pavement course.
20. The support product of claim 19, wherein the pavement course further comprises a fill material, wherein: the cells contain the fill material; and the fill material comprises one or more of: a cementitious material; a bituminous material; and a granular fill material.