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(56) Documents Cited:
GB 2439216 A **EP 1736616 A1**
EP 0058768 A **WO 2002/088485 A1**
SE 008007536 A **US 4333280 A**

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(54) Title of the Invention: **A vehicle parking structure**
Abstract Title: **Vehicle parking structure with corrugated support panels**

(57) The structure 100 comprises a corrugated support 18 for supporting a car parking surface 12 such as a fibre reinforced polymer sheet and a member 106 fastened to a peak 102 of the corrugated support and a support structure 20, such as a beam, upon which the corrugated support is supported. The member may also be a fibre reinforced plastic. The member may comprise at least one projection 112 projecting from a base and shaped so that the sides of the projection are sloped and to compliment the shape of the peak. The top of each projection may comprise a channel. Each peak may have a resilient portion located on it. Joining the support structure to the peaks means that no drill or screw holes are necessary within the troughs of the corrugated support, meaning that any water that collects in the troughs does not leak through.

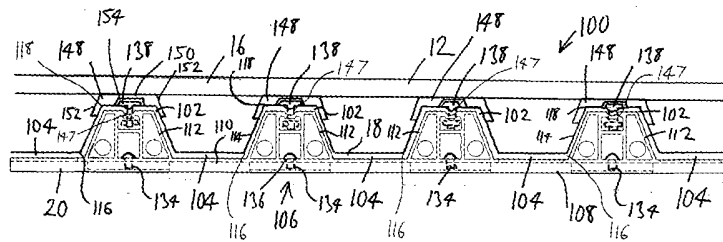


FIG. 6

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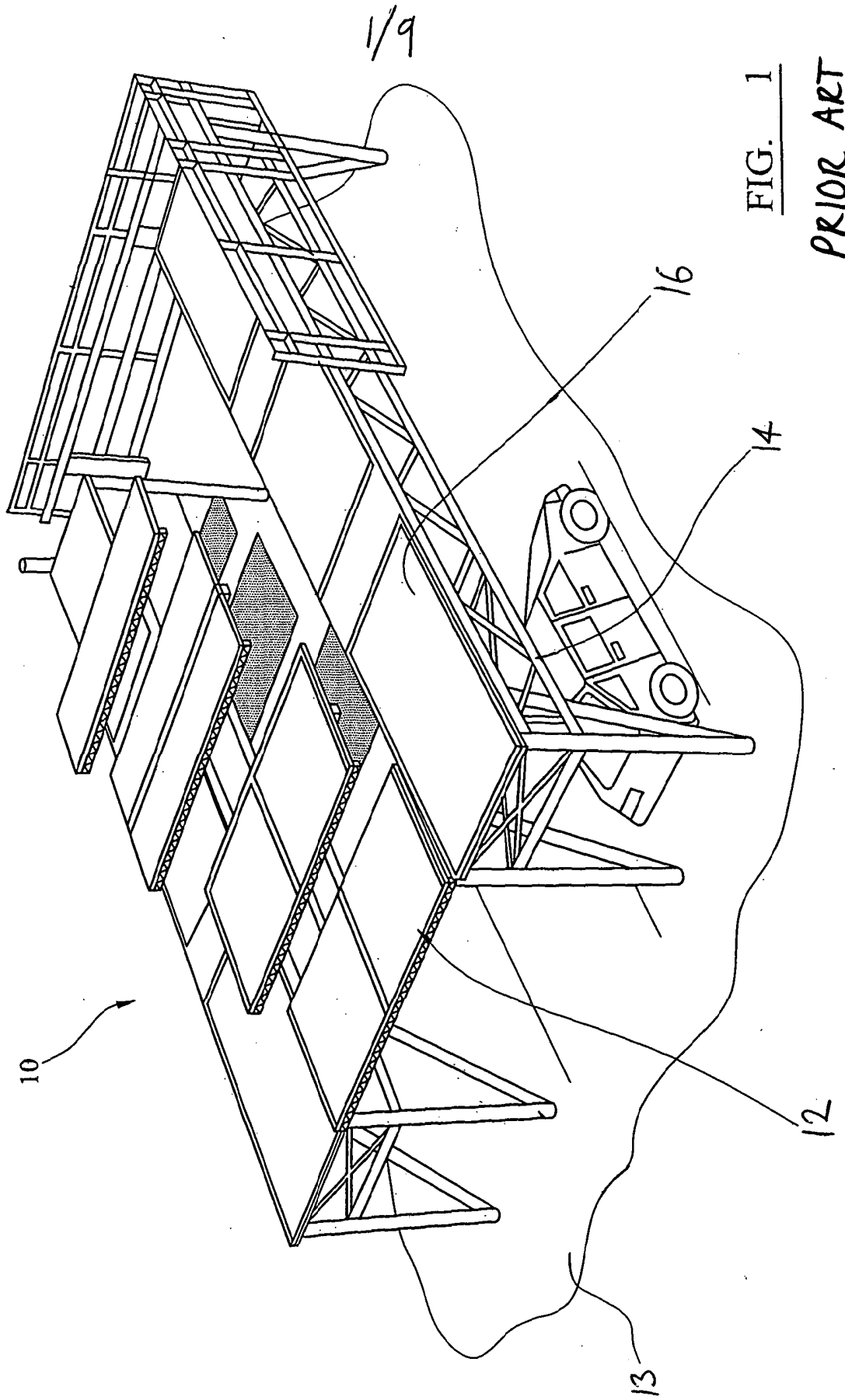


FIG. 1

PRIOR ART

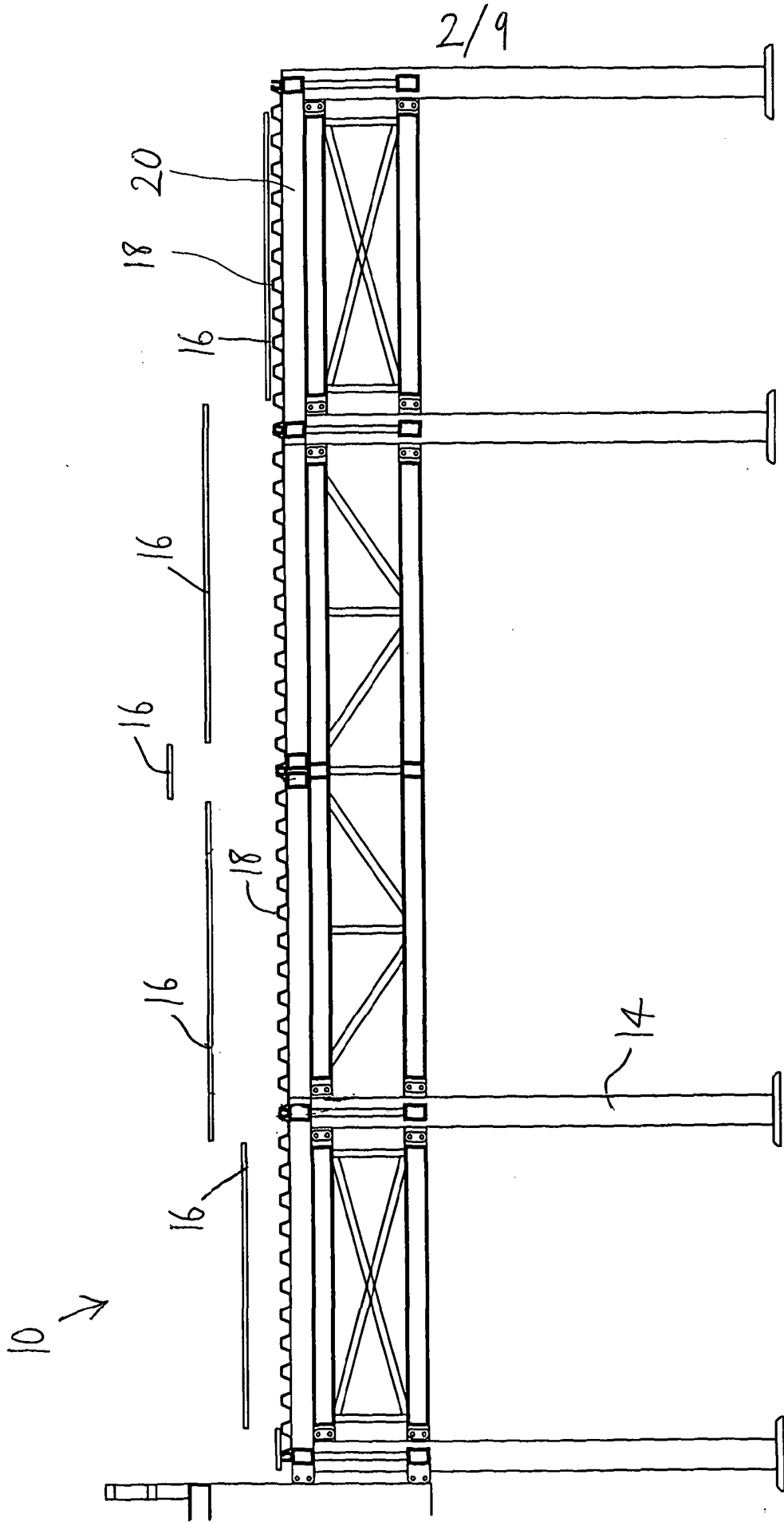


FIG. 2
PRIOR ART

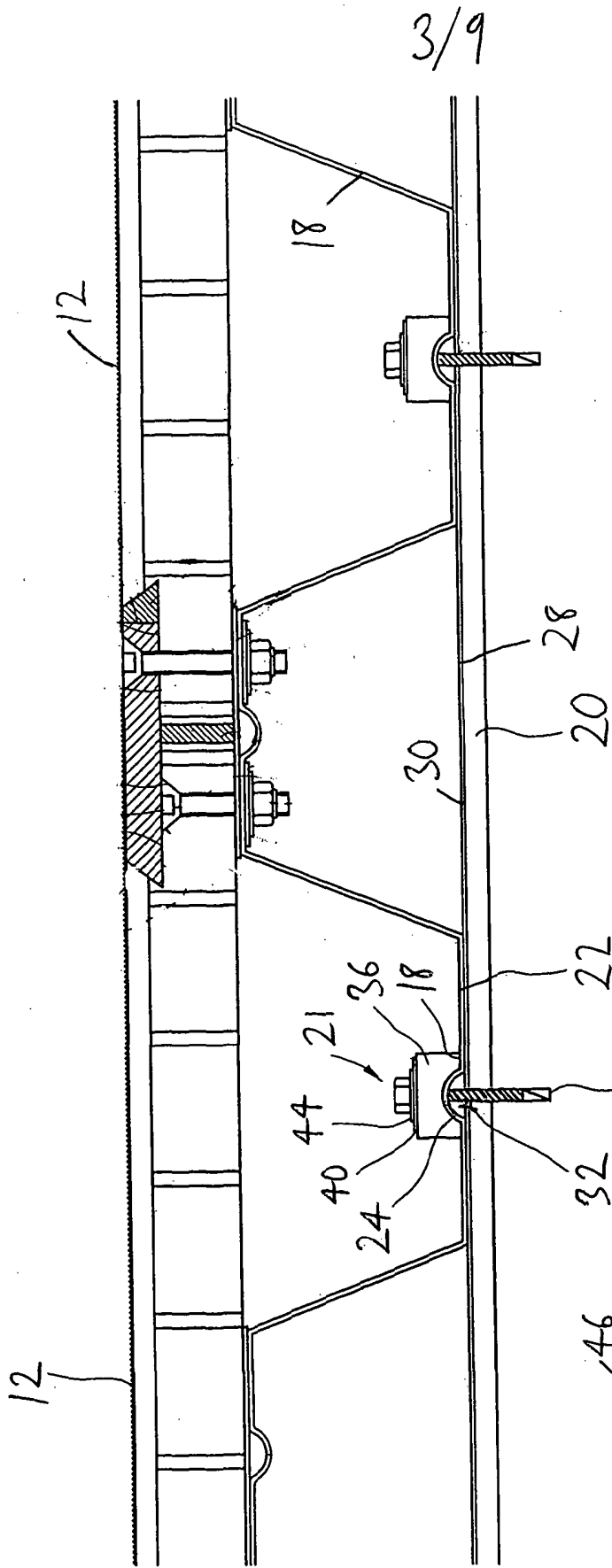
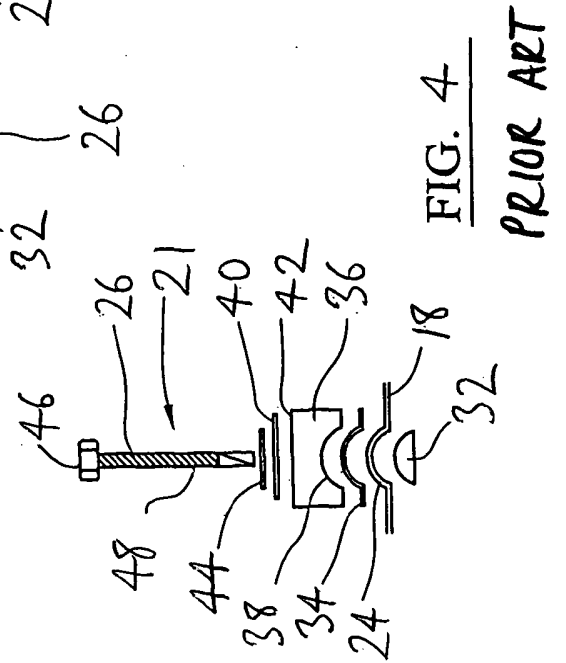


FIG. 3
PRIOR ART



4/9

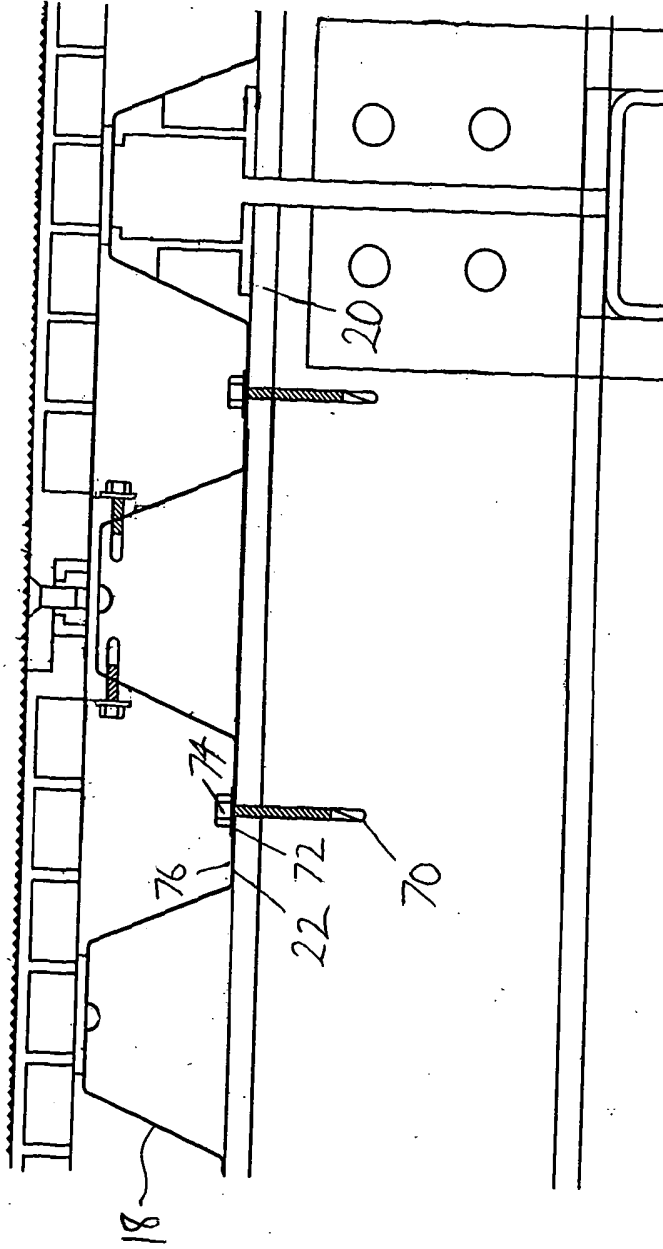
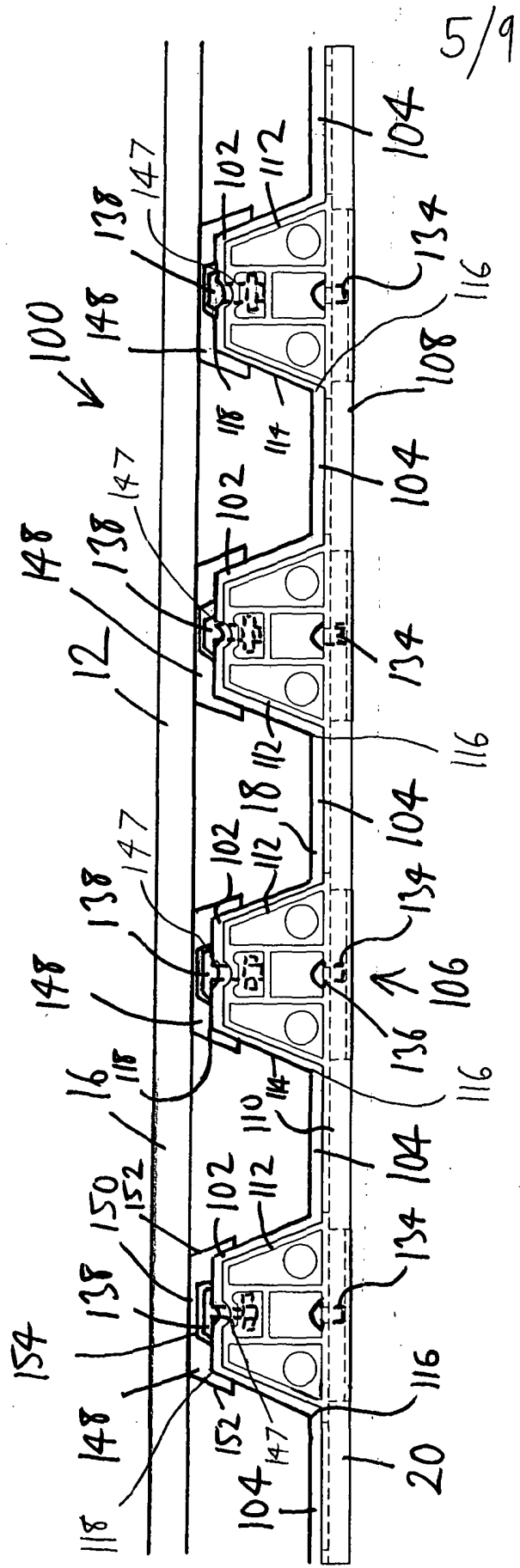


FIG. 5
PRIOR ART



5/9

FIG. 6

6/9

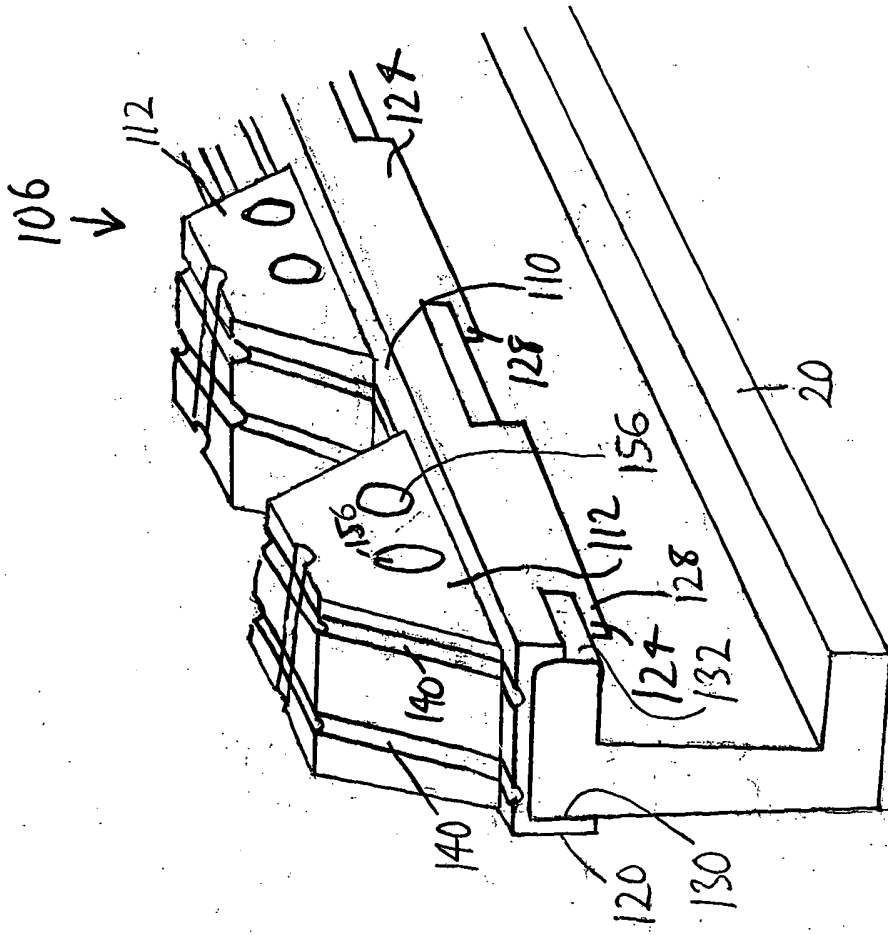


FIG. 7

FIG. 8A

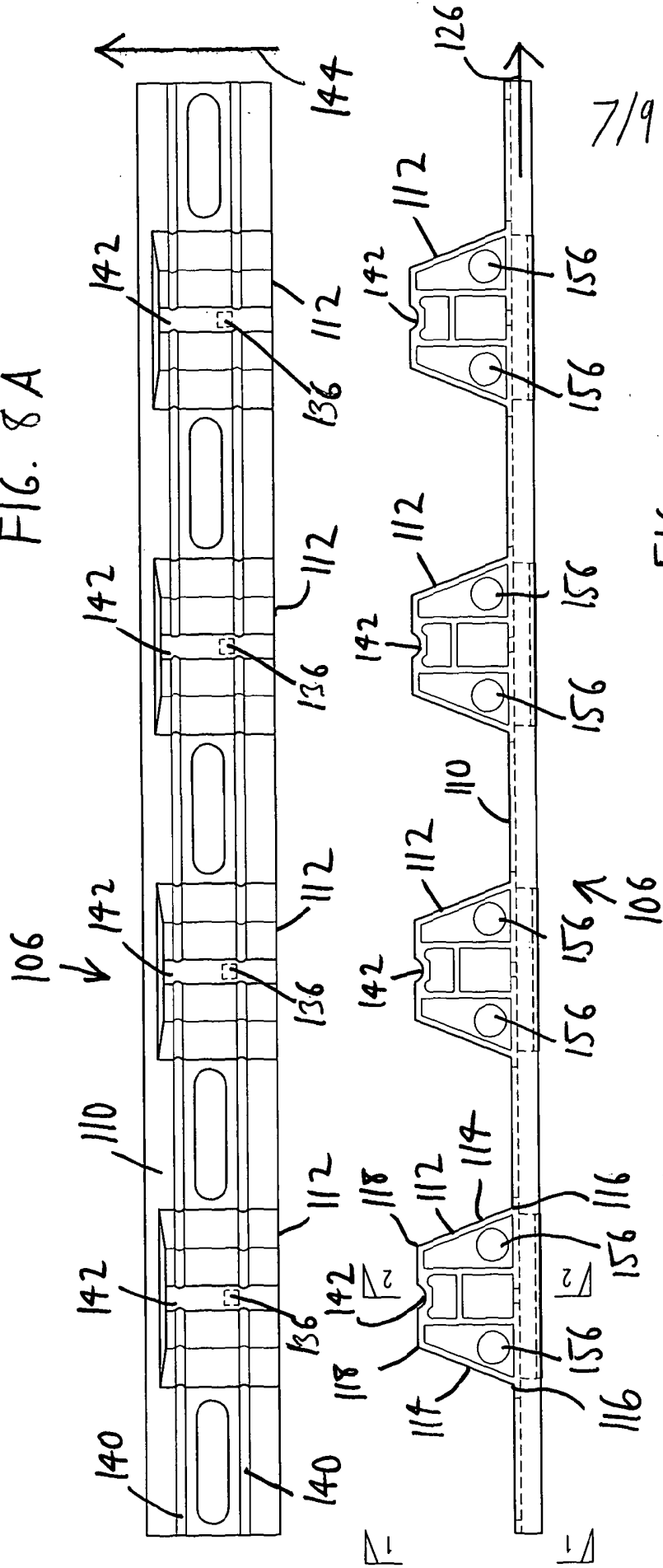
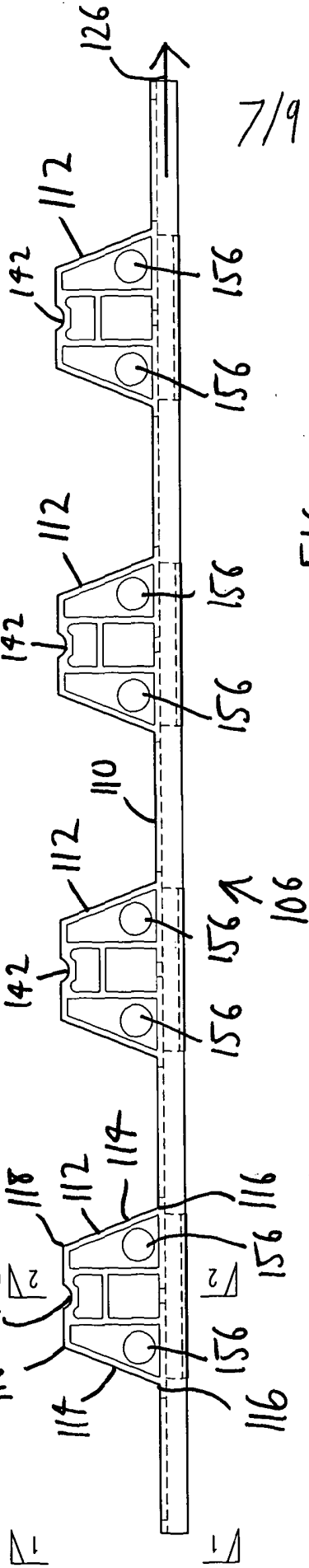


FIG. 8B



7/9

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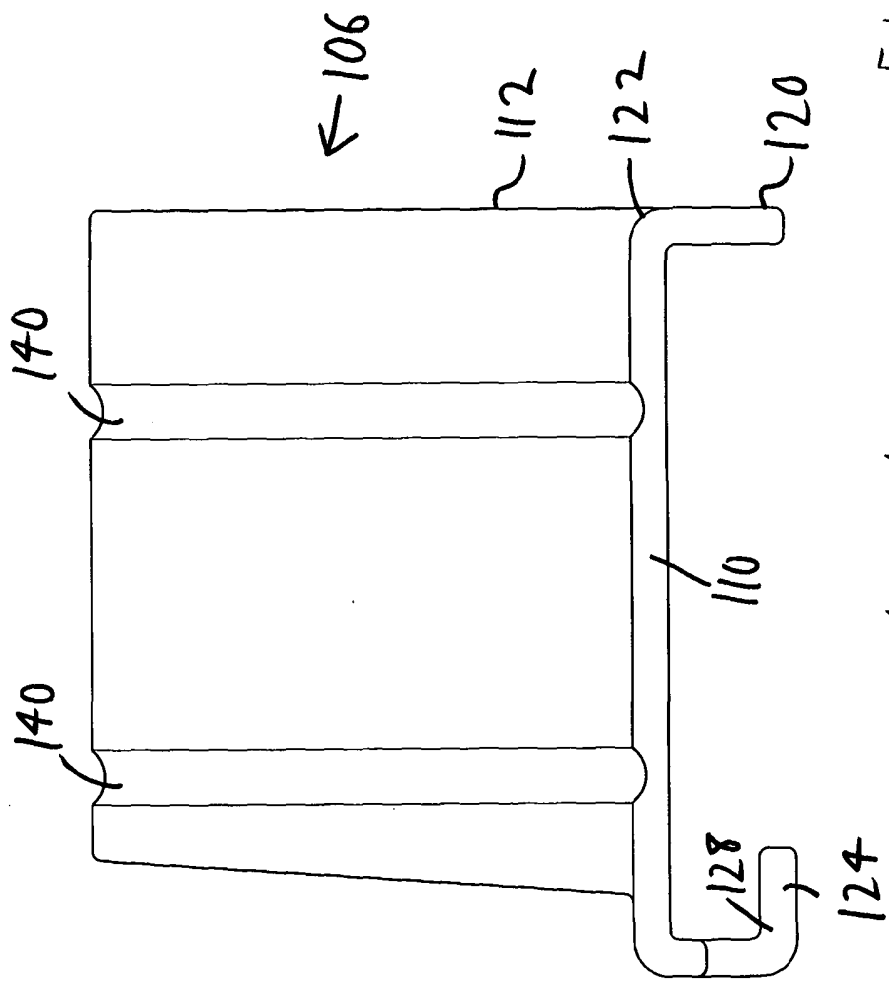


FIG. 8C

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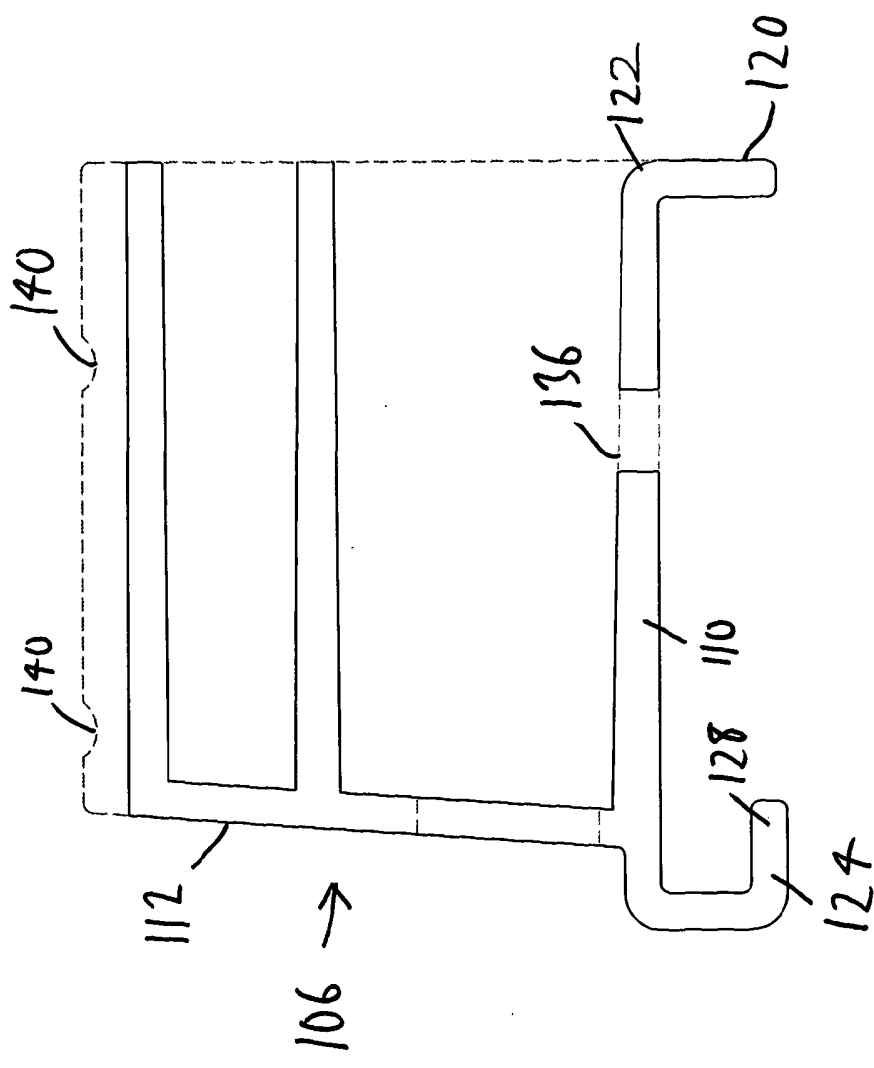


FIG. 8D

2 - 2

A VEHICLE PARKING STRUCTURE

BACKGROUND OF THE INVENTION

The present invention relates to a vehicle parking structure, a member for a vehicle
5 parking structure, and a method of fastening a corrugated support of a vehicle
parking structure for supporting a parking surface to a support structure.

The vehicle parking structure described herein is a modification to the car park
structure described in the applicant's (Condek Holdings Limited) UK patent No.
10 GB2439216. The member for a vehicle parking structure and method of fastening
a corrugated support of a vehicle parking structure for supporting a parking surface to
a support structure described herein are particularly intended for, although not limited
to, use in the type of car park described in GB2439216.

The car park 10 of GB2439216 is illustrated in Figures 1 and 2. The car park
15 comprises a parking surface 12 for cars to park on that is supported above
ground 13 by a steel framework 14 or support structure. The parking surface is
formed of sheets 16 of glass fibre reinforced plastics. The sheets are fastened to
a corrugated steel support or profile sheeting 18. The corrugated support is
fastened to beams 20 of the steel framework.

20 The fastening of the corrugated support 18 to the beams 20 should be water
tight, in particular, to prevent rainwater falling through the corrugated support into
the space below, typically forming a ground level car parking area. This is
because water dripping down from the support to the space below is unpleasant
to people below. The arrangement should also help absorb vibrations caused by
25 vehicles being driven over the parking surface.

GB2439216 describes two fastening arrangements to fasten the corrugated
support 18 to the beams 20. These are illustrated in Figures 3 and 4; and Figure
5 respectively.

In the arrangement of Figures 3 and 4, the corrugated supports 18 are fastened
30 to the beams 20 with a fastening arrangement 21 as follows.

Troughs 22 of the corrugated support 18, which have a channel 24 extending along them, are fastened to a beam 20 of the steel framework 14, by a threaded fastener 26 fastened through a hole through the channels of the corrugated support and into the beam.

- 5 A sealing surface 28 in the form of waterproof tape, and in particular mastic tape, is applied to the upper surface 30 of the beam 20.

Lugs 32 in the form of semi-circular cross-section cylinders, each complementary in shape to the channels 24, are located on the tape 30. The lugs are made from waterproof mastic. The corrugated support 18 is positioned on the tape and the lugs are aligned with the channels so that they lie in the channels. Resilient and waterproof plastics sheet in the form of neoprene sheet 34 having a complementary shape to the channels is located on the other side of channels. A saddle portion 36 is located over each neoprene sheet. Each saddle portion is cuboid in shape and comprises a semi-circular cross-section channel 38 along its surface. The semi-circular channel 38 is complementary to the neoprene sheet. A planar resilient and waterproof plastics sheet in the form of neoprene sheet 40 is located on the other, flat side 42 of the saddle portion. A washer 44, made from stainless steel, is located on the planar neoprene sheet. A through hole (not shown) passes through the centre of all the components of this fastening arrangement and into the beams 20 to which the profile sheeting is fastened. A threaded fastener or screw 26 in the form of a Tek screw is screwed through the fastening arrangement 21 such that the head 46 of the screw is on the profile sheeting side and the shank 48 projects into the beam 20.

This arrangement does not lead to a fully water tight seal around the screws and water can drip down from the corrugated support. Furthermore, this arrangement is complicated to install and errors can easily be made during installation by builders. As a result, an even worse water tight seal is achieved and yet more rain water can drip down from the corrugated profile sheeting. Furthermore, even if properly installed, this arrangement is not particularly effective in absorbing vibrations from vehicles driving over the parking surface.

Another arrangement described in GB2439216 for fastening the profile sheeting to the beams and the sheets of the car park surface to the profile sheeting is illustrated in Figure 5.

5 In the arrangement of Figure 5, the profile sheeting 18 is fastened to the beam by 20 a screw 70 passing through a through hole in the trough 22 of the profile sheeting. A plastics washer 72 is located between the head 74 of the screw and the upper surface 76 of the trough of the corrugated support or profile sheeting.

10 Again, this arrangement does not properly seal around the screws leading to water dripping down from the corrugated sheeting. Also, in this arrangement, errors can easily be made during installation by builders, particularly by omitting the plastics washer 72 and, as a result, an even worse water tight seal is achieved resulting in yet more rainwater dripping down from the corrugated support. Furthermore, even if properly installed, this arrangement is not particularly effective in absorbing vibrations from vehicles driving over the parking surface.

15 The inventor of the arrangement described herein is the first to appreciate that by locating a member between and fastened to a peak of the corrugated support and a support structure, such as a beam, that the corrugated support can be fixed to the beam without having holes or penetrations in the troughs of the corrugated support. In this way, rainwater does not leak through the corrugated support to the space below.

SUMMARY OF THE INVENTION

25 The invention is defined in the independent claims below to which reference should now be made. Advantageous features are set forth in the dependent claims.

A preferred embodiment of the invention is described in more detail below and takes the form of a vehicle parking structure comprising a corrugated support for supporting a parking surface, such as sheets of glass fibre reinforced plastics. 30 The corrugated support comprises peaks and troughs. A member is located

between and is fastened to at least one peak of the corrugated support and a support structure, such as a beam.

Preferred embodiments have a member or support block comprising fibre reinforced plastics, and in particular glass reinforced polypropylene or glass filled polypropylene.

5 This is a particularly advantageous feature.

The arrangement using a support block of glass filled polypropylene has a low density or is less dense, which reduces the dead load of the system overall. The elasticity of this member is good, which means that it is good at absorbing vibrations
10 from vehicles driving over the parking surface. This arrangement is less likely than other materials, such as glass filled nylon, to fail during assembly or in use. The water absorption of this material is low (less water is absorbed than with other materials such as glass filled nylon) and this improves the longevity of the member.

15 BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in more detail by way of example with reference to the accompanying drawings, in which:

Figure 1 (prior art) is an isometric view of a known vehicle parking structure;

Figure 2 (prior art) is a view from the side of a known vehicle parking structure;

20 Figure 3 (prior art) is a view from the side of part of the known vehicle parking structure of Figure 2;

Figure 4 (prior art) is an exploded view from the side of part of the vehicle parking structure of Figure 3;

25 Figure 5 (prior art) is a view from the side of part of another known vehicle parking structure;

Figure 6 is a cross sectional view of a vehicle parking structure embodying an aspect of the present invention;

Figure 7 is an isometric view of part of a member of part of the vehicle parking structure of Figure 6 attached to a beam;

Figure 8A is a view from above of part of the member of Figure 6;

Figure 8B is a view from the side of the member of Figure 8A;

Figure 8C is a cross-sectional view of the member of Figure 8B viewed from line 1-1; and

5 Figure 8D is a cross-sectional view of the member of Figure 8B viewed from line 2-2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A vehicle parking structure 100 and a member 106 for a vehicle parking structure will now be described with reference to Figures 6, 7 and 8A to 8D. Some
10 features are referred to in the prior art described above and these features are given the same reference numerals.

Referring first with particular reference to Figure 6, vehicle parking structure 100 comprises a corrugated support 18 with product code RL60 supporting a parking
15 surface 12 of sheets of glass fibre reinforced plastics 16. The corrugated support comprises peaks or ribs 102 and troughs 104. The member 106 is located between and fastened to at least one peak of the corrugated support and a support structure, such as, in this example, a beam or channel 108.

The member or support block 106 comprises fibre reinforced plastics. The plastics are, in particular, polypropylene and the fibre is, in particular, glass. In other words,
20 the member 106 is constructed from, and, in particular, completely constructed from, glass filled polypropylene. The support block is made by injection moulding. This is a particularly advantageous arrangement as described above.

The member 106 has a base 110 from which at least one projection 112, in this case
25 a plurality of projections, project. Four projections are shown, but there may be other numbers, for example 11. Between 1 and 12 projections is typical. The projections are spaced apart along the base. Each projection is complementary in shape to each of the peaks 102 of the corrugated support 18 to enable it to be located beneath the peaks of the corrugated support. Each projection comprises sides 114 sloping
30 towards one another from a base end 116 located at the base to another top end 118

(see Figure 8B). That is to say, they are trapezoidal blocks with two parallel sides (the base end and top end). The projections are spaced from one edge of the base, typically by 10mm. The projections are spaced from the edge of the base on which the hooks 124 of the clip (described below) are located.

5

The base 110 is adapted to clip to the beam 108 by a clip (see in particular Figures 7, 8C and 8D). The clip is formed by a flanged edge 120 of one edge 122 of the base and by hooks 124 spaced apart along a longitudinal axis 126 of the base. Each hook has a portion 128 extending inwardly for engaging with the beam (typically an
10 overhanging portion of the beam). In use, the flanged edge rests against an edge 130 of the beam and the hooks engage, through the resilience of the material from which the member is made, with another, opposing, edge 132 of the beam.

As shown in Figure 6, the base end 116 of each block or projection 112 is also bolted
15 to the beam 108, with M8 dome head bright zinc plate screws 134, which pass through a through hole 136 in the base end of each block.

The top end 118 of each block 112 is fastened with adhesive, such as glue, to the corrugated support 18. The top end of each block is also bolted to each peak or rib
20 of the corrugated support structure with, in this example, flat hexagonal head bolts 138.

The member 106 is fastened to the beam 108 before the corrugated support or sheet 18 is fastened to the member.
25

The top end 118 of each block 112 and the base 110 have channels 140 extending along their upper surface (see Figures 7 and 8A).

At least one, and in this example, a pair of channels 140 extend over the surface of
30 the projections 112 in the direction of the longitudinal axis 126 of the base 110. The channels have a semi-circular cross-section. The pair of channels extend continuously along the upper surface of the member 106 from one end to the other, over the surface of the projections or blocks and over the upper surface of the base. These channels form glue or adhesive bead grooves. The adhesive for adhering the
35 corrugated support 18 to the member 106, in the form of glue or adhesive beads, is

located in these grooves or channels. The adhesive is applied along the full length of channel 140, along the whole length of the member 106.

5 At least one channel, and in this example, a single channel 142 extends over the surface of the top end 118 of each of the projections or blocks 112 in the direction of a transverse axis 144 of the base 110. The fastener or bolt (flat hexagonal head bolts 138) for fastening the top end 118 of each block 112 of the member 106 to the corrugated support 18 is located through a through hole 147 of each of these channels. The through hole 147 (see Figure 6) is drilled through the corrugated
10 sheet at a factory.

The troughs 104 of the corrugated support 18 have no through holes or penetrations. Because of this, rainwater running into the troughs does not leak through the corrugated support to the space below and the troughs remain clean. In other words,
15 by using fixing points at the top of the RL60 panels, water leaks through the lower troughs are eradicated.

This arrangement also transfers loads from the RL60 panels of corrugated support 18 to supporting channels below. This means that the corrugated support 18 is utilised
20 as a structural support.

Furthermore, this arrangement acts as noise suppression system as there is a plastics spacer between the RL60 or corrugated member 18 and supporting channels. This means that there is no metal on metal contact. Metal on metal
25 contact is noisy in this type of car park system when a car drives through the car park.

A noise suppression 148 flashing is located over each peak or rib 102 of the corrugated support 18 and over the head of each of the bolts 138. Each noise
30 suppression flashing is formed of a resilient portion, in this example of rubber, typically of 5mm thickness, located over each peak of the corrugated support and over the head of each of the bolts. The resilient portions are each complementary in shape to each upper portion of each peak of the corrugated support and the head of the bolt or fastener projecting through. That is to say, they comprise a sheet 150 with
35 flanged edges 152 that project, slightly, outwardly. The sheet has a recess 154 in it for housing the head of the bolt.

The projections or blocks 112 each have at least one through hole 156, in this example, a pair of through holes, through them. Electrical cables or closed-circuit television (CCTV) cables (not shown) for the car park are passed through these
5 through holes. The through holes of each block are spaced apart in the longitudinal direction 126 of the base 110. The through holes extend through in the direction of a transverse axis 144 of the base.

The corrugated support 18 with product code RL60 is typically rolled in a single
10 sheet 15.4m long.

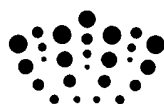
The invention has been described with reference to example implementations, purely for the sake of illustration. The invention is not to be limited by these, as many modifications and variations would occur to the skilled person. The
15 invention is to be understood from the claims that follow.

CLAIMS

1. A vehicle parking structure comprising:
a corrugated support for supporting a parking surface, such as sheets of
5 glass fibre reinforced plastics, wherein the corrugated support comprises peaks and
troughs; and
a member located between and fastened to at least one peak of the
corrugated support and a support structure, such as a beam.
- 10 2. A vehicle parking structure according to claim 1, wherein the member
comprises fibre reinforced plastics.
3. A vehicle parking structure according to claim 2, wherein the plastics
comprises polypropylene.
- 15 4. A vehicle parking structure according to claim 2 and 3, wherein the fibre
comprises glass.
4. A vehicle parking structure according to any preceding claim, further
20 comprising a parking surface.
5. A vehicle parking structure according to claim 4, wherein the parking surface
comprises at least one sheet.
- 25 6. A vehicle parking structure according to claims 5, wherein the at least one
sheet comprises fibre reinforced plastics.
7. A vehicle parking structure according to any preceding claim, wherein the
member comprises at least one projection and the or each projection is
30 complementary in shape to at least one of the peaks for locating beneath at least one
of the peaks.
8. A vehicle parking structure according to claim 7, wherein the or each
projection comprises sides sloping towards one another from one end to another.
- 35

9. A vehicle parking structure according to claim 7 or 8, wherein the member comprises a base from which the or each projection projects.
10. A vehicle parking structure according to claim 9, wherein the sides of the or
5 each projection slope towards one another from one base end located at the base to another top end.
11. A vehicle parking structure according to any of claims 7 to 10, comprising a
10 plurality of said projections and wherein the projections are spaced apart along the base.
12. A vehicle parking structure according to claim 10 or 11, wherein the top end comprises at least one channel extending along it.
13. A vehicle parking structure according to claim 12, wherein at least one of the
15 at least one channels extends in the direction of a transverse axis of the base for a fastener for fastening the member to the corrugated support.
14. A vehicle parking structure according to claim 12 or 13, wherein the at least
20 one of the at least one channels comprises at least one channel extending over the surface of the projections in the direction of the longitudinal axis of the base for adhesive.
15. A vehicle parking structure according to claim 14, wherein the at least one
25 channel extending over the surface of the projections in the direction of the longitudinal axis of the base comprises a pair of channels.
16. A vehicle parking structure according to any of claims 10 to 15, wherein a
30 resilient portion is located over the or each peak of the corrugated support.
17. A vehicle parking structure according to claim 16, wherein the resilient portion is complementary in shape to at least an upper portion of the or each peak of the corrugated support and a fastener projecting through the or each peak of the
35 corrugated support.

18. A vehicle parking structure according to any of claims 7 to 17, wherein the or each projection comprises at least one through hole for electrical cables wherein the at least one through hole extends in the direction of a transverse axis of the base.
- 5 19. A vehicle parking structure according to any preceding claim, wherein the base is adapted to clip to the support structure.
20. A vehicle parking structure according to claim 19, wherein the base is adapted to clip to the support structure by a clip formed by a flanged edge of one edge of the base and hooks spaced along a longitudinal axis of the base each hook having a portion extending inwardly for engaging with the support structure, such that, in use, the flanged edge rests against an edge of the support structure and the at least one hook engages with another edge of the support structure.
- 10
21. A vehicle parking structure according to any preceding claim, wherein the troughs of the corrugated support have no through holes.
- 15
22. A member for a vehicle parking structure according to any of claims 1 to 21.
- 20 23. A method of fastening a corrugated support of a vehicle parking structure for supporting a parking surface to a support structure, and the corrugated support comprising peaks and troughs, the method comprising fastening a member to a peak of the corrugated support and to the support structure.



Application No: GB0921335.6

Examiner: Mr Kunal Saujani

Claims searched: 1-23

Date of search: 29 March 2011

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

| Category | Relevant to claims | Identity of document and passage or figure of particular relevance |
|----------|---|--|
| X,Y | [x] 1-4i, 7, 9-11, 21-23 [y] 4ii-6, 16-18 | WO 02/088485 A1 (ROEHM) - See abstract and Figures |
| X,Y | [x]1-4i, 7, 9-11, 21-23 [y] 4ii-6, 16-18 | EP 0058768 A (ROEHM) - See Figures and abstract. |
| X,Y | [x]1, 7-11, 21-23 [y] 4ii-6, 16-18 | US 4333280 A (MORTON) - See in particular part 50 and Figures 7 and 8 |
| Y | 4ii-6, 16-18 | GB 2439216 A (CONDEK) - See whole document |
| A | - | EP 1736616 A1 (MUSSINI) - See whole document |
| A | - | SE 8007536 A (GOETAVERKEN CITYVARVET) - See Figures |

Categories:

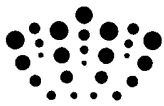
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

E01D; E04C; E04H



The following online and other databases have been used in the preparation of this search report

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International Classification:

| Subclass | Subgroup | Valid From |
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| E04H | 0006/10 | 01/01/2006 |
| E04C | 0002/32 | 01/01/2006 |