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(54) **Roadway**

Fahrbahn

Voie carrossable

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**EP-A- 0 469 265 GB-A- 2 289 079
NL-A- 9 101 642**

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Description

[0001] This invention relates to a roadway, having an associated drainage unit, which is suitable for use in an elevated structure such as a bridge or multi-storey car park.

[0002] Figure 1 shows a typical drainage unit 1. This is designed to be placed at the side of a road on a bridge so that the road surface at the edge of the road is level with the bottom edge of the holes 2. The camber of the road causes water to run off the road surface and pass into the drainage unit through the holes 2. The hole 3 in the end wall allows water to pass into an adjacent unit. Units are placed next to one another to produce a drain running the length of the bridge.

[0003] Figure 2 shows a cross-section through a typical bridge. A concrete deck 4 is covered with a waterproof membrane 5 and a layer of red sand asphalt 6 to protect the waterproof membrane. The road is surfaced with an asphalt base course 7A and an asphalt wearing course 7B. The asphalt layers will not be watertight, and some water will permeate through them. The red sand asphalt layer is less permeable to water than the other asphalt layers, and water will accumulate in the asphalt layers 7A, 7B. This water will hereinafter be referred to as "subsurface water".

[0004] If subsurface water continues to accumulate the asphalt layers will eventually become saturated; water will then appear on the road surface, causing a driving hazard. In winter, repeated freezing and thawing of the subsurface water will damage the road. Furthermore, when a vehicle passes along the road the weight of the wheel will cause a "pumping action" on the subsurface water in the road construction. A "bow wave" 8 is pushed through the asphalt layers 7A, 7B towards the side of the road. The water cannot enter the drainage unit 1, and it is deflected upwards by the drainage unit, as indicated by the arrows. This causes rapid deterioration of the road surface, as the water will tend to carry the binding particles contained in the asphalt upwards out of the asphalt layers and deposit them as silt 9 on the road surface. Such deposits of silt form another driving hazard.

[0005] It is possible to make some allowance for the relief of subsurface water by leaving small gaps beneath and/or between adjacent edge kerbs or drainage units to provide a drainage path. Although these gaps initially provide a drainage path they quickly silt up and block the passage of water.

[0006] Figure 3 shows a drainage unit 1' in which some holes 2' have a V-shaped lower edge. The unit is positioned so that the V-shaped portion of the holes are below the road surface, so subsurface water within the asphalt layers can pass through the holes into the drainage unit.

[0007] This drainage unit is not satisfactory. If the V-shape part of the holes is shallow it will not collect all the subsurface water from the asphalt layers. If the V-

shaped part extends to the bottom of the drainage unit, however, it will then be possible for water to drain off the road surface, enter the drainage unit through the top part of the holes and pass back into the road through the lower part of the holes.

[0008] GB-A-2 257 734 discloses a subsurface bridge drain unit which has a perforated collection chamber. This is buried in the road, so that the perforations in the collection chamber are in the lower part of the asphalt base course 7A. The collection chamber has an outlet which passes through the bridge deck. Subsurface water enters the collection chamber and is drained away through the outlet.

[0009] This drainage unit will not drain surface water effectively, so it is therefore necessary to provide conventional drains as well as the subsurface drainage unit. Furthermore, each subsurface drainage unit requires a hole through the bridge deck which will weaken the bridge.

[0010] EP-A-0 469 265 discloses a drainage unit for a road having a water-permeable upper layer. The drainage unit is provided with a first aperture for receiving surface water, and with a second aperture for receiving water from the interior of the water-permeable upper layer. The first and second apertures drain into a common channel, so that it is possible for water entering the drainage unit through the first aperture to pass back into the interior of the water-permeable upper layer of the road via the second aperture. Furthermore, this drainage unit cannot drain water from the base courses of the road.

[0011] The present invention provides a roadway having the features claimed in claim 1.

[0012] Both surface and sub-surface water will be drained. Surface water will be drained through the first apertures, and sub-surface water will be drained through the second apertures.

[0013] In a preferred embodiment, the first and second apertures connect with respective first and second drainage channels in the drainage unit, the two channels not being in direct fluid communication with one another.

[0014] In a preferred embodiment, third apertures are provided adjacent the asphalt wearing course. These will provide improved drainage of water from the wearing course.

[0015] Preferred embodiments of the present invention will now be described by way of example with reference to the accompanying Figures in which:

Figure 1 is a perspective view of a known drainage unit;

Figure 2 shows a cross-section of a road;

Figure 3 is a perspective view of another known drainage unit;

Figure 4 is a schematic view of a roadway, incorporating a drainage unit, according to one embodiment of the present invention;

Figure 5(a) shows components of another drainage

unit suitable for use in a roadway of the present invention;

Figure 5(b) shows the drainage unit of Figure 5(a) in its assembled state;

Figure 5(c) shows components of another drainage unit suitable for use in a roadway of the present invention;

Figure 6 shows a further drainage unit suitable for use in a roadway of the present invention;

Figure 7 is a cross-section of a further drainage unit suitable for use in a roadway of the present invention;

Figure 8 is a cross-section of a further drainage unit suitable for use in a roadway of the present invention;

Figure 9 is a perspective view of a further drainage unit suitable for use in a roadway of the present invention; and

Figure 10 is a cross-section of a roadway, incorporating a drainage unit, according to another embodiment of the present invention.

[0016] Figure 4 shows a roadway incorporating a drainage unit 10. The unit is provided with a wall 13 which defines a closed channel 14. Subsurface water passes from the road through the lower apertures 15 into the channel 14, as a result either of natural drainage or of a "bow wave" caused by a vehicle. Surface water passes through upper apertures 16 into the interior 17 of the drainage unit. Both surface and subsurface water is effectively drained from the road. The surface water cannot enter the channel 14 and so is unable to pass back into the road construction layers.

[0017] For ease of construction, the unit is formed of a base 11 and a cover 12. Figure 5a shows an alternative drainage unit suitable for use in a roadway of the invention, and shows the base 11' separated from the cover 12'. The cover is provided with prongs 22; when the cover is placed on the base an upper aperture is defined by a pair of adjacent prongs, as shown in Figure 5b. Figure 5(c) shows an alternative design for the cover 11' and base 12'.

[0018] The cover 12, 12' and the base 11, 11' can be made of any suitable material. In one embodiment the base is manufactured in ductile iron, which is chosen for its good finish and strength. The cover is made from a composite material, and this allows the cover to be produced in any desired colour. The cover is secured to the base by any suitable means.

[0019] Figure 6 shows an alternative base unit 11". The channel 14 is provided with a hatch 18 which can be removed to provide access to the channel. This allows the channel to be inspected or cleaned. The cover can also be provided with a removable hatch (not shown), to avoid the need to remove the whole cover to provide access to the base. In use, it would be advisable if inspection hatches were provided every 20m or so.

[0020] The drainage unit is installed on a bedding lay-

er of mortar 19 which has a thickness of, for example, 5mm. The end face of the unit is coated with a sealant, and the unit is pushed firmly against the previous unit to make a watertight seal between the two units.

[0021] The base is provided with projections 20 at one end, and the other end is provided with complementary recesses. These projections and recesses provide interlocking between two adjacent units, which lessens the chance of a unit being displaced if it is struck by a vehicle.

[0022] Figure 7 shows a cross-section of an alternative drainage unit suitable for use in a roadway of the present invention. The channel 14 is not closed, but is defined by a wall 20 and a ledge 21. The ledge 21 extends beyond the channel, so surface water entering the unit is directed into the interior of the unit and cannot enter the channel (unless the depth of water in the interior exceeds the height of the wall 20). The ledge 21 is shown as being part of the base unit in Figure 7, but it could be part of the cover.

[0023] Another drainage unit suitable for use in a roadway of the present invention is illustrated in Figure 8. The wall 13' defining the channel for subsurface water is horizontal, so that the channel for subsurface water is below the channel for surface water. The structure of Figure 8 could also be realised by constructing a drainage channel for subsurface water and placing conventional drainage units (as shown in Figure 1, for example) over the channel for subsurface water to form the drainage channel for surface water.

[0024] It is not necessary for every drainage unit in a roadway of the present invention to have apertures for receiving both surface and subsurface water. For example, it would be possible to manufacture two different drainage units, one having only apertures for receiving surface water and the other having only apertures for receiving subsurface water. The drain would be formed from a combination of both units - for example, with the two units alternating with one another.

[0025] A further drainage unit suitable for use in a roadway of the present invention is illustrated in Figure 9. Figure 10 shows another embodiment of a roadway of the present invention, which incorporates a drainage unit as shown in Figure 9.

[0026] The drainage unit of Figure 9 again has a channel 14, and has lower apertures 15 through which subsurface water can enter the channel. The unit is also provided with upper apertures 16 for receiving surface water.

[0027] The drainage unit shown in Figure 9 is intended for use on a roadway for which porous asphalt is specified as the wearing surface 7B. Porous asphalt is used to reduce surface water spray, by allowing water to percolate into the top 50mm of the road construction. Conventional drainage units as in Figure 1 cannot drain this water from the top 50mm of the road construction.

[0028] The drainage unit shown in Figure 9 is provided with intermediate apertures 23, provided at a height

that is intermediate between the lower and upper apertures. When the drainage unit is installed, the intermediate apertures will be at the same level as the wearing surface 7B of the road construction. Water that has percolated into the porous asphalt wearing surface of the roadway of Figure 10 will drain away through the intermediate apertures into the drainage unit.

[0029] As with the other examples, described herein-above, of drainage units suitable for use in a roadway of this invention, the unit of Figure 9 has a base 11a and a cover 12a. The base and cover can be made of any suitable material - for example, the base unit could be made of cast iron or ductile iron, and the cover can be made from a composite material.

[0030] The intermediate apertures 23 connect with the main interior drainage channel 17. The apertures 23 are made as large as possible commensurate with retaining the structural integrity of the drainage unit, in particular its resistance to impact by vehicles. The front edges 25 of the central bars 24 are pointed and the side walls 26 of the apertures chamfered to reduce resistance to the flow of water.

Claims

1. A roadway comprising a base (6) as its lowermost layer, an asphalt base course (7A) disposed over the waterproof base; an asphalt wearing course (7B) disposed over the asphalt base course (7A), the asphalt courses (7A,7B) being pervious to water; and a drainage unit (10);

characterised in that the base (6) is a substantially waterproof base;

in that the drainage unit (10) is disposed adjacent to a side edge of the asphalt wearing course (7B) and a side edge of the asphalt base course (7A);

in that the drainage unit (10) has a side wall facing and disposed adjacent to the asphalt courses (7A,7B) and extending above the upper surface of the asphalt wearing course (7B), first drainage apertures (16) being provided in the side wall above the asphalt wearing course (7B), to receive surface water for passage into the drainage unit;

and **in that** the substantially waterproof base (6) abuts against the side wall of the drainage unit, second drainage apertures (15) being provided in the side wall of the drainage unit immediately adjacent the interface between the asphalt base course (7A) and the substantially waterproof base (6) for draining water from the interface between the asphalt base course (7A) and the substantially waterproof base (6).

2. A roadway as claimed in claim 1 wherein that the first and second apertures (15,16) communicate with respective first and second channels in the

drainage unit, the two channels not being in direct fluid communication with one another.

3. A roadway as claimed in claim 1 or 2, wherein third apertures (23) are provided adjacent the asphalt wearing course (7B).

Patentansprüche

1. Fahrbahn, die aufweist: eine Tragschicht (6) als ihre unterste Schicht; einen Asphaltunterbau (7A), der über der wasserdichten Tragschicht angeordnet ist; eine Asphaltverschleißdecke (7B), die über dem Asphaltunterbau (7A) angeordnet ist, wobei die Asphalt-schichten (7A, 7B) wasserdurchlässig sind; und eine Entwässerungseinheit (10);

dadurch gekennzeichnet, daß die Tragschicht (6) eine im wesentlichen wasserdichte Tragschicht ist;

daß die Entwässerungseinheit (10) angrenzend an einen Seitenrand der Asphaltverschleißdecke (7B) und einen Seitenrand des Asphaltunterbaus (7A) angeordnet wird;

daß die Entwässerungseinheit (10) eine Seitenwand aufweist, die zu den Asphalt-schichten (7A, 7B) hin liegt und angrenzend daran angeordnet ist und sich über die obere Fläche der Asphaltverschleißdecke (7B) erstreckt, wobei erste Entwässerungsöffnungen (16) in der Seitenwand über der Asphaltverschleißdecke (7B) vorhanden sind, um Oberflächenwasser für einen Durchfluß in die Entwässerungseinheit aufzunehmen;

und daß die im wesentlichen wasserdichte Tragschicht (6) gegen die Seitenwand der Entwässerungseinheit anstößt, wobei zweite Entwässerungsöffnungen (15) in der Seitenwand der Entwässerungseinheit unmittelbar angrenzend an die Grenzschicht zwischen dem Asphaltunterbau (7A) und der im wesentlichen wasserdichten Tragschicht (6) für das Ablassen von Wasser von der Grenzschicht zwischen dem Asphaltunterbau (7A) und der im wesentlichen wasserdichten Tragschicht (6) vorhanden sind.

2. Fahrbahn nach Anspruch 1, bei der die ersten und zweiten Öffnungen (15, 16) mit entsprechenden ersten und zweiten Kanälen in der Entwässerungseinheit verbunden sind, wobei die zwei Kanäle nicht in einer direkten Flüssigkeitsverbindung miteinander sind.

3. Fahrbahn nach Anspruch 1 oder 2, bei der dritte Öffnungen (23) angrenzend an die Asphaltverschleißdecke (7B) vorhanden sind.

Revendications

1. Voie carrossable comprenant une base (6) constituent sa couche inférieure extrême; une assise de base d'asphalte (7A) agencée au-dessus de la base imperméable à l'eau; une assise d'usure d'asphalte (7B) agencée au-dessus de l'assise de base d'asphalte (7A), les assises d'asphalte (7A, 7B) étant perméables à l'eau; et une unité de drainage;

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caractérisée en ce que la base (6) est une base pratiquement étanche à l'eau;

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en ce que l'unité de drainage (10) est agencée près d'un bord latéral de l'assise d'usure d'asphalte (7B) et d'un bord latéral de l'assise de base d'asphalte (7A);

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en ce que l'unité de drainage (10) comporte une paroi latérale faisant face aux assises d'asphalte (7A, 7B) et est adjacente à celles-ci, et s'étendant au-dessus de la surface supérieure de l'assise d'usure d'asphalte (7A), des premières ouvertures de drainage (16) étant agencées dans la paroi latérale au-dessus de l'assise d'usure d'asphalte (7B) pour recevoir l'eau de surface en vue du passage dans l'unité de drainage;

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et **en ce que** la base pratiquement étanche à l'eau (6) bute contre la paroi latérale de l'unité de drainage, des deuxièmes ouvertures de drainage (15) étant agencées dans la paroi latérale de l'unité de drainage en un emplacement immédiatement adjacent à l'interface entre l'assise de base d'asphalte (7A) et la base pratiquement étanche à l'eau (6) pour drainer l'eau de l'interface entre l'assise de base d'asphalte (7A) et la base pratiquement étanche à l'eau (6).

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2. Voie carrossable selon la revendication 1, dans laquelle les premières et deuxièmes ouvertures (15, 16) communiquent avec des premier et deuxième canaux respectifs dans l'unité de drainage, les deux canaux n'étant pas en communication de fluide directe.

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3. Voie carrossable selon les revendications 1 ou 2, dans laquelle des troisièmes ouvertures (23) sont agencées près de l'assise d'usure d'asphalte (7B).

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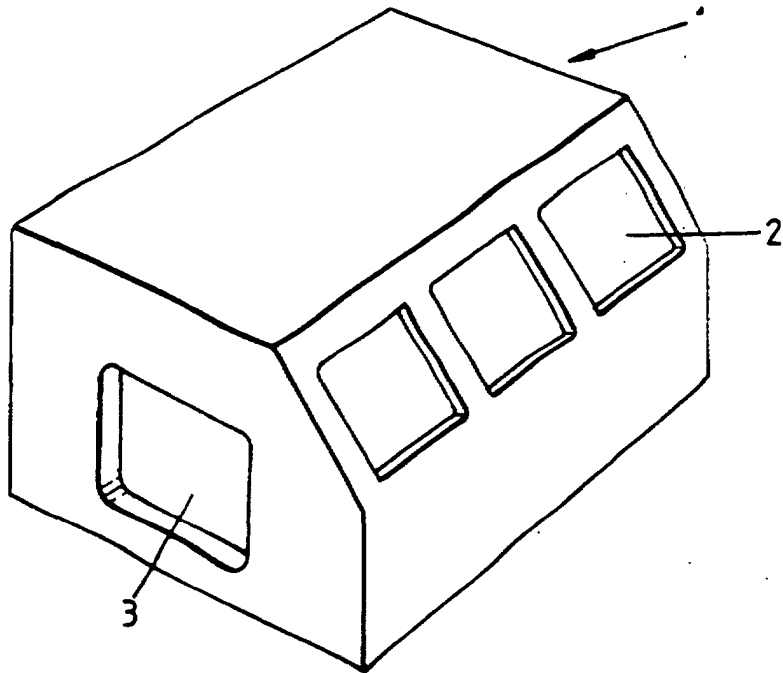


FIG. 1

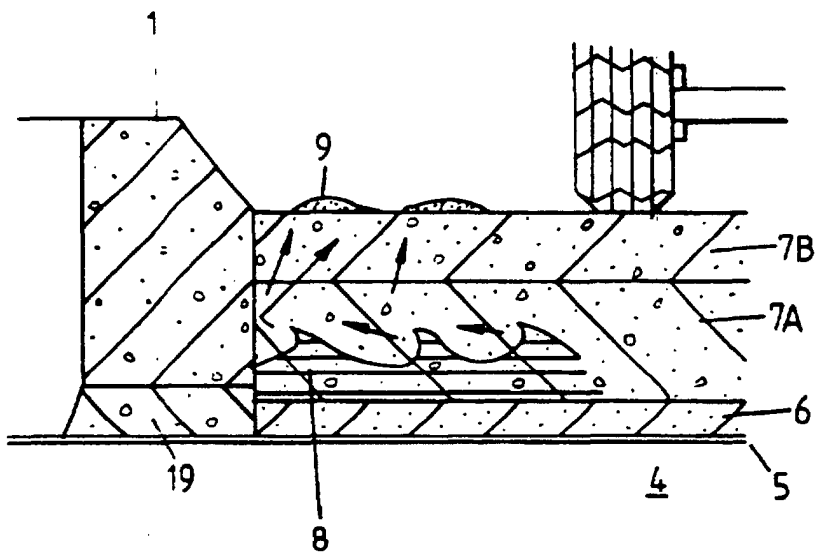


FIG. 2

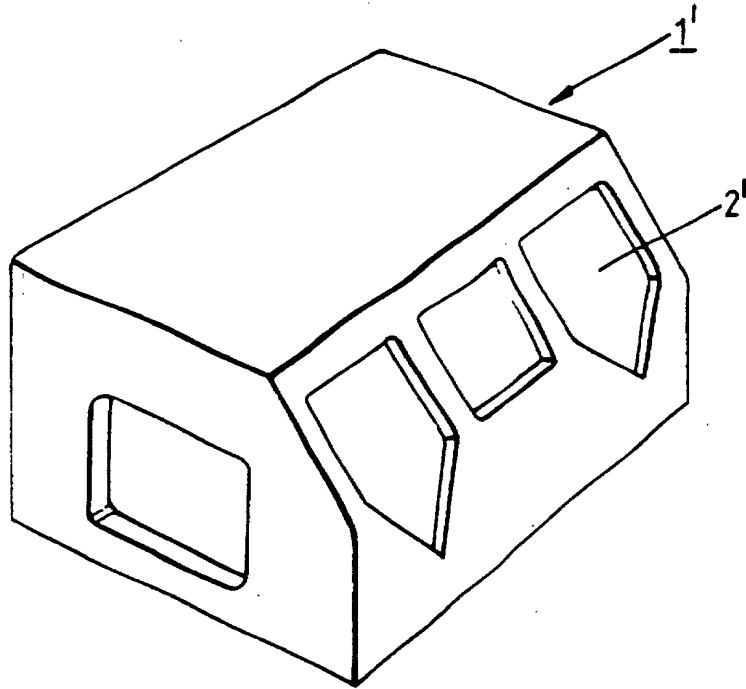


FIG. 3

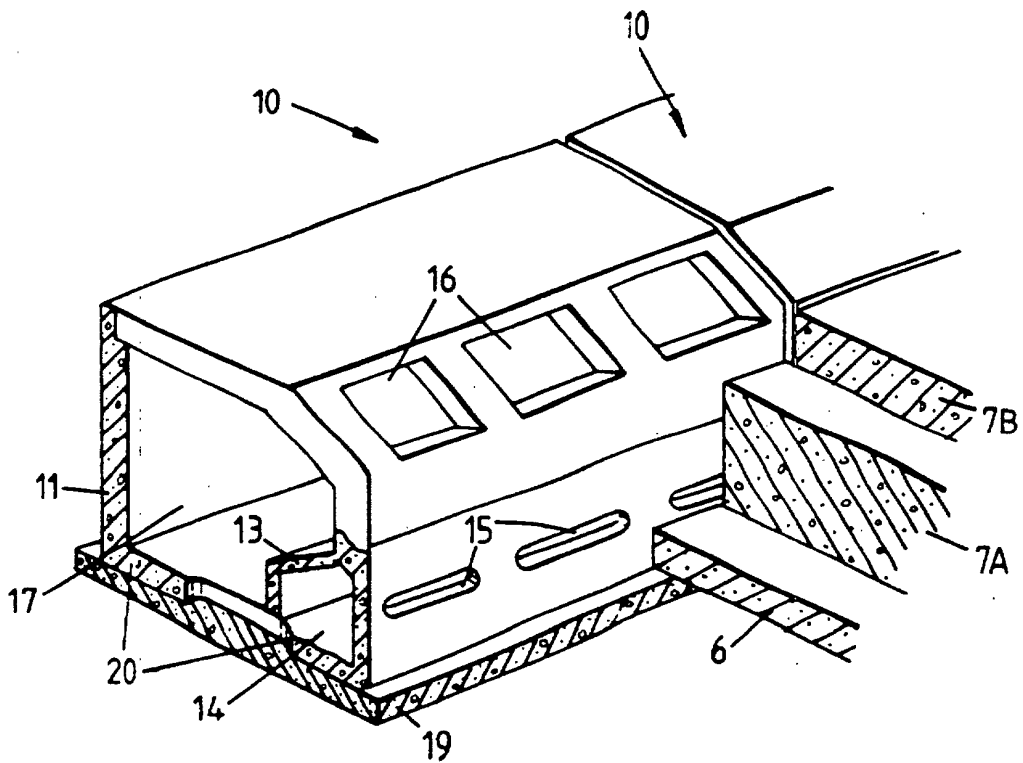


FIG. 4

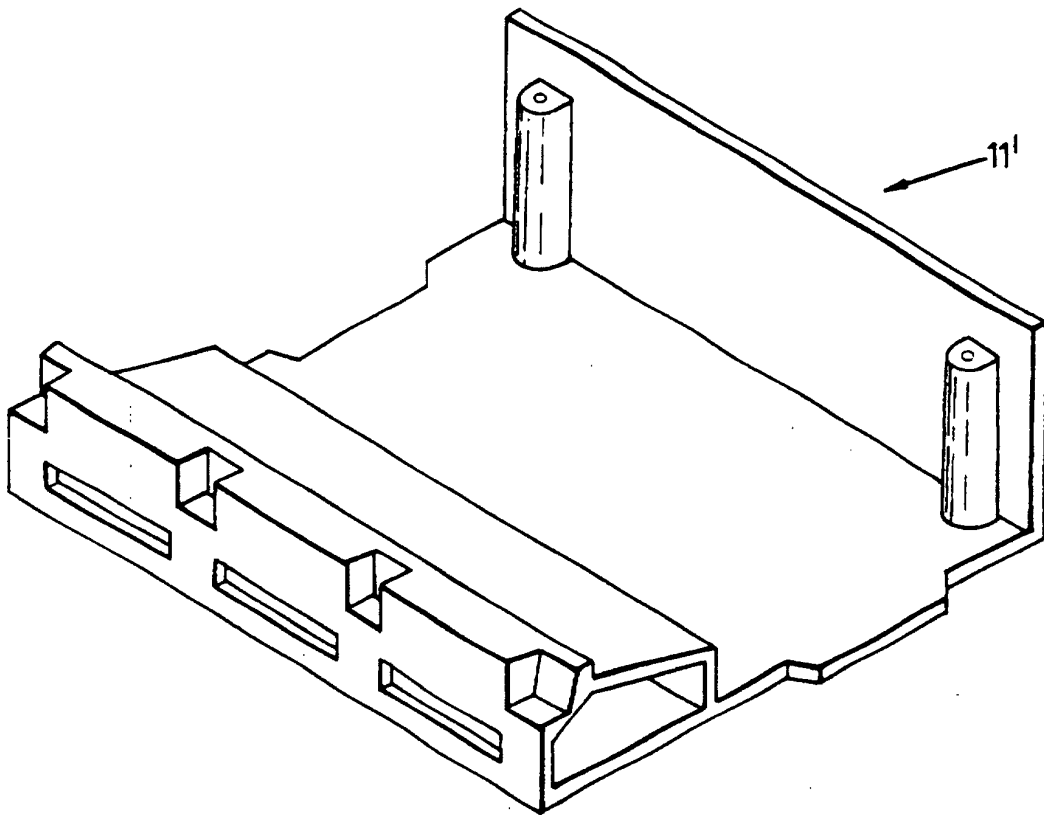
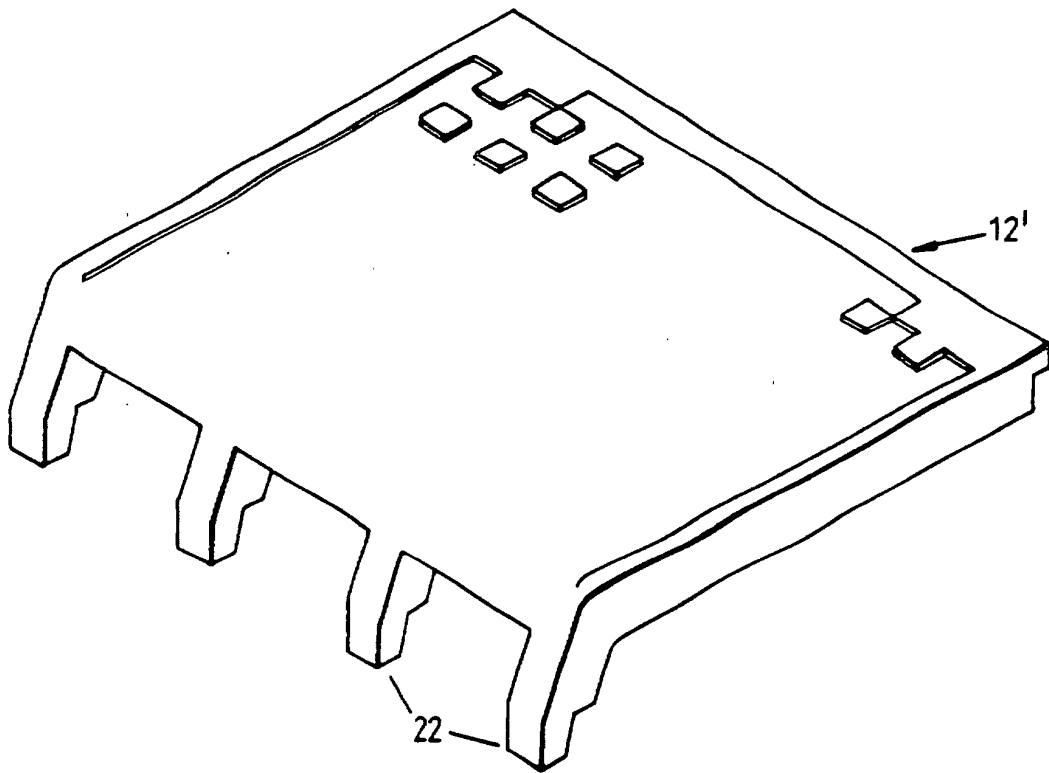
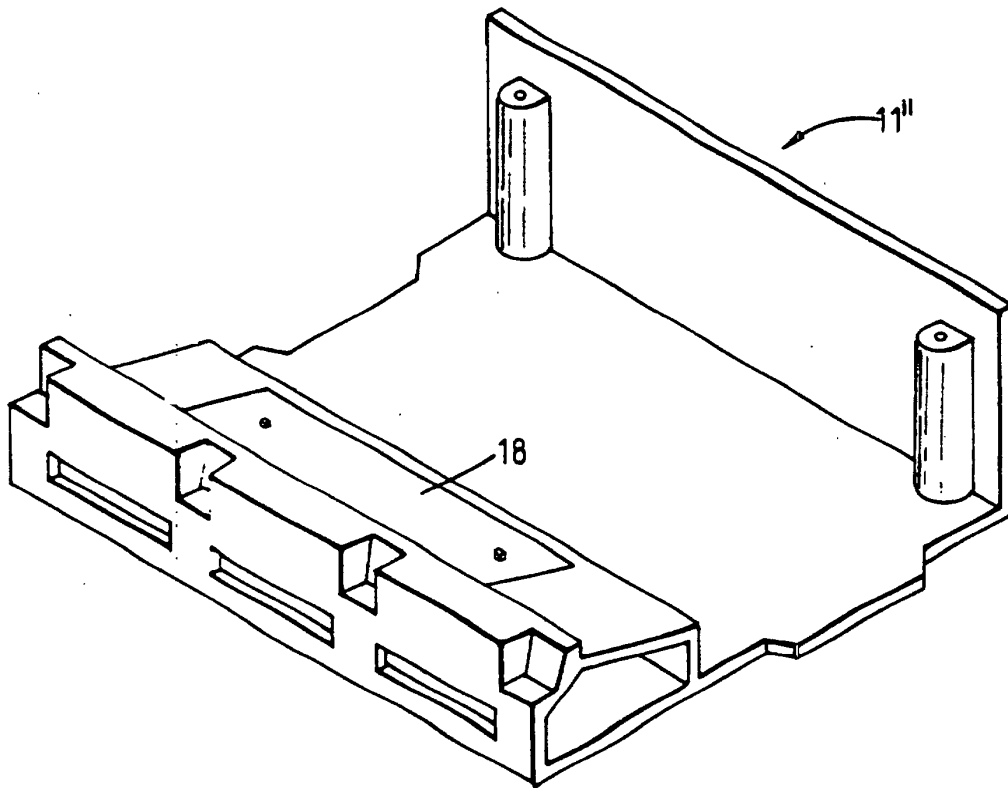
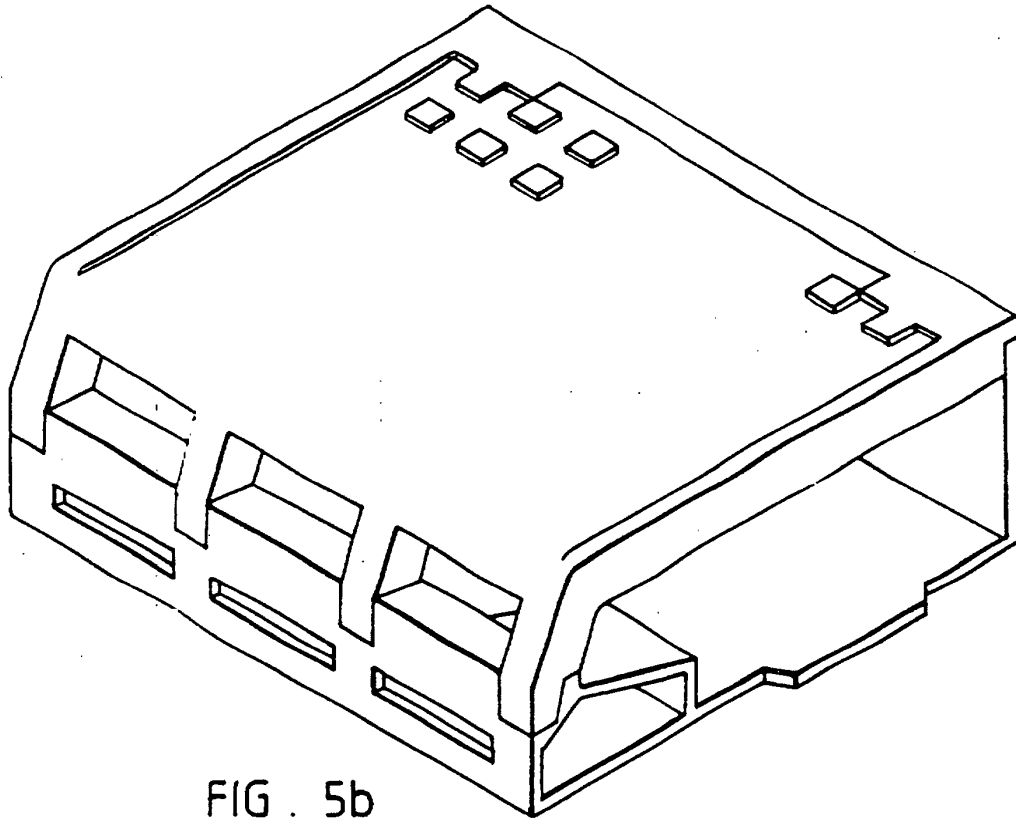


FIG .5a



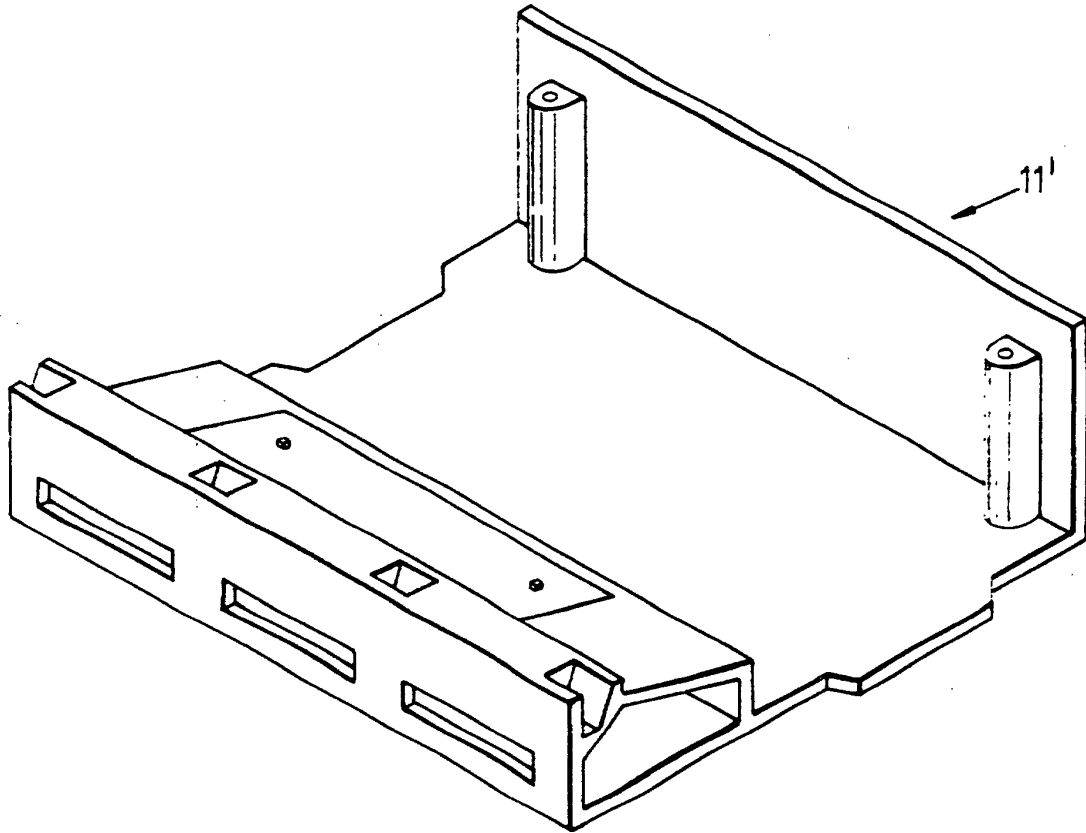
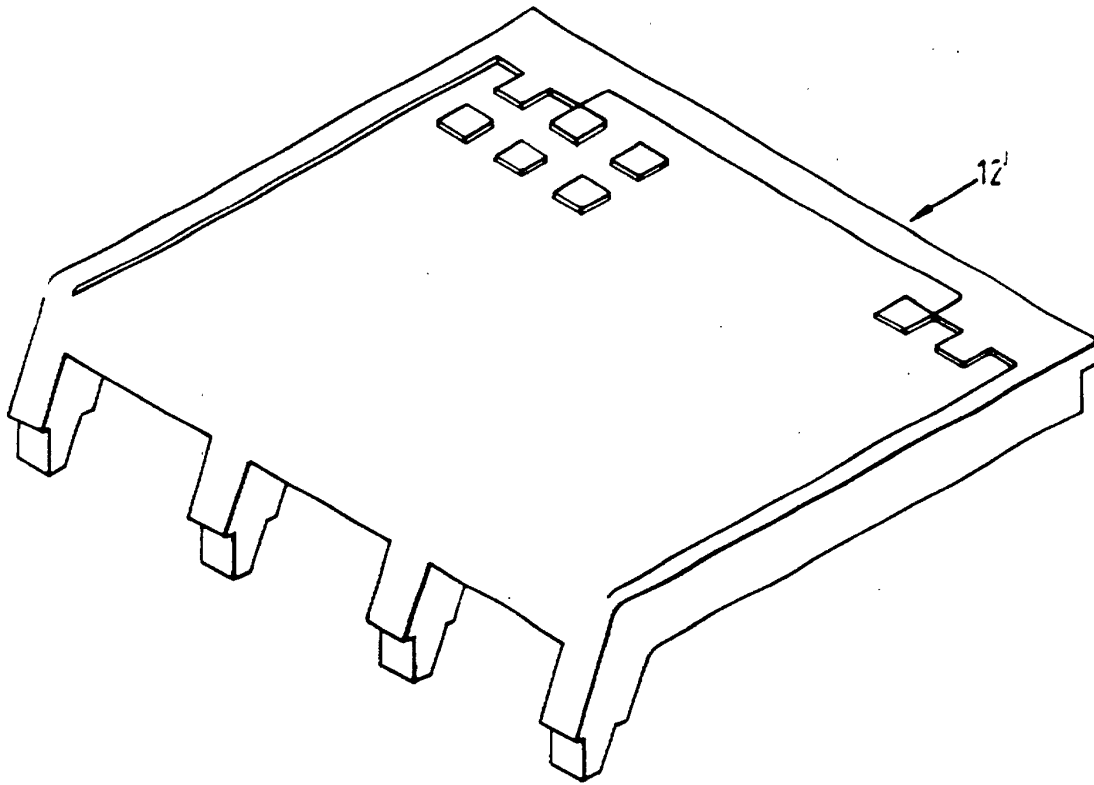


FIG. 5c

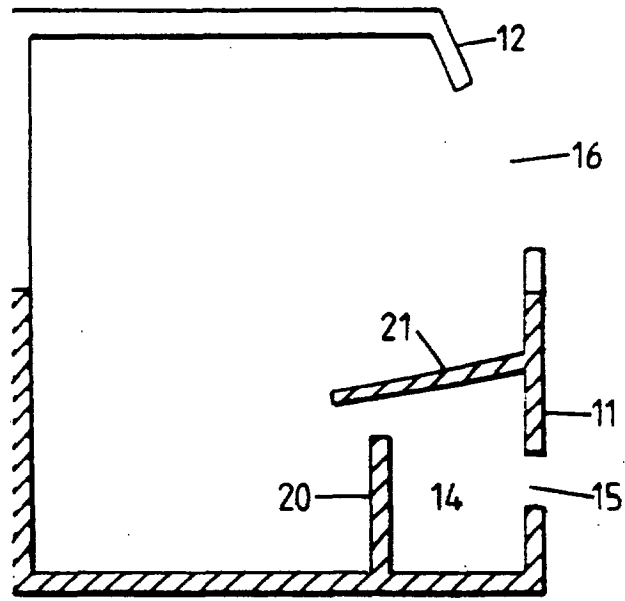


FIG. 7

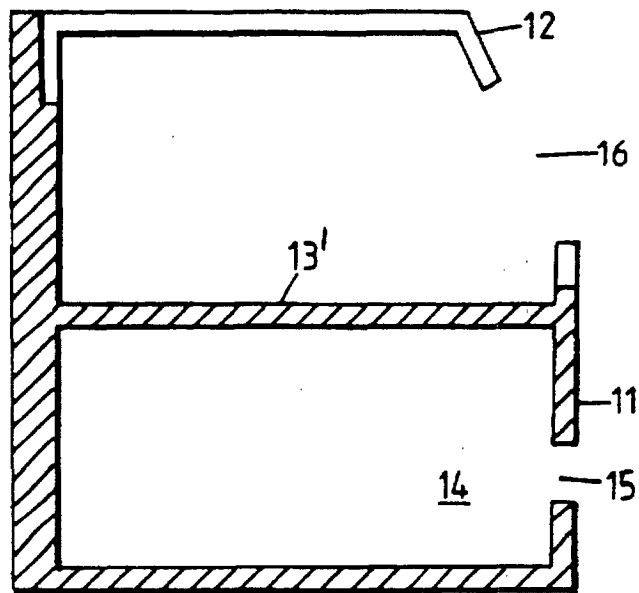


FIG. 8

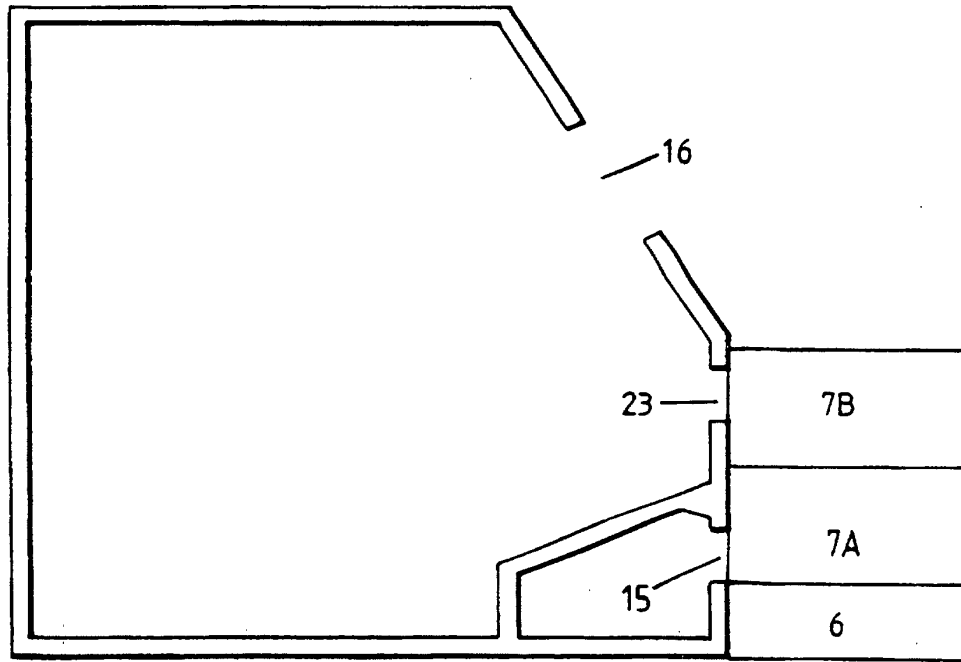
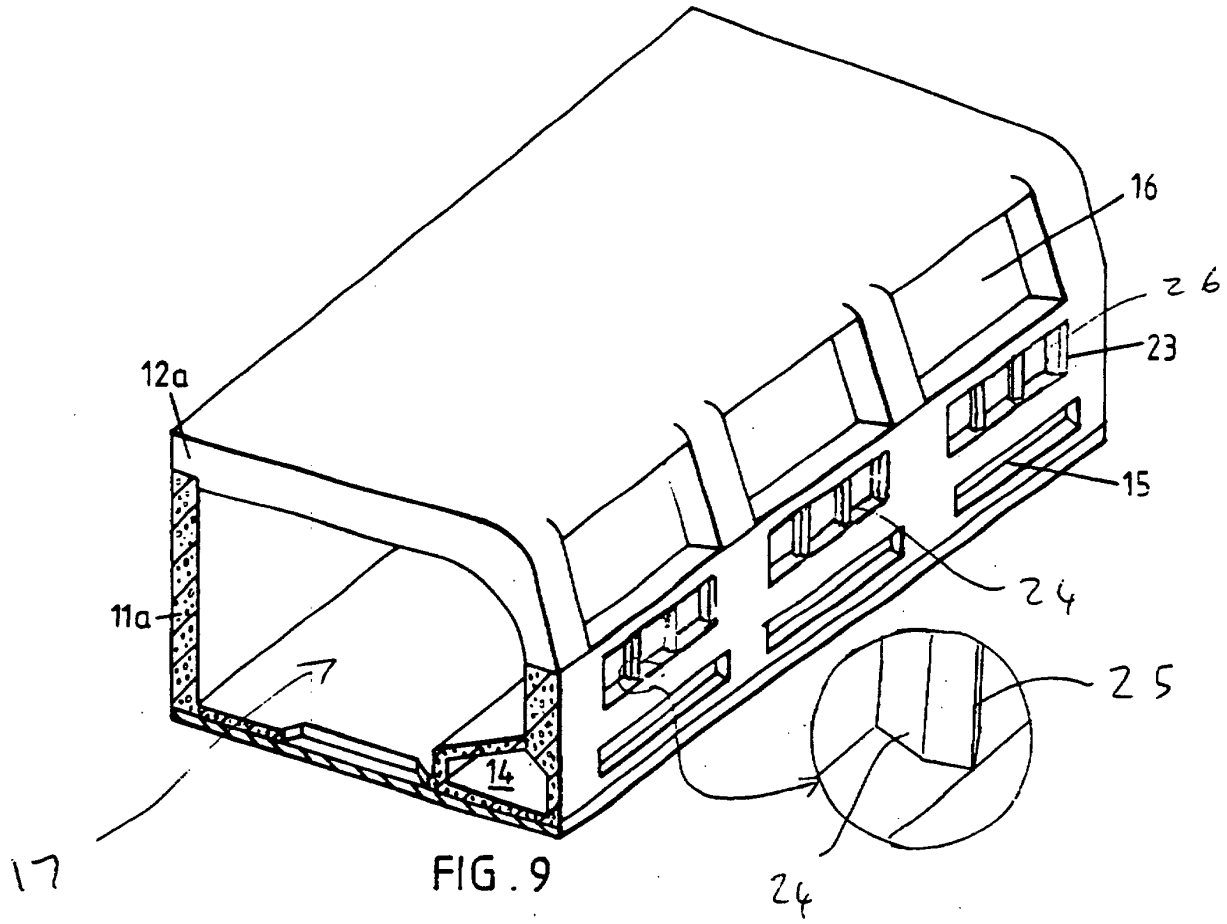


FIG. 10