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(54) **A DRAINAGE INSTALLATION FOR ROADS**

ENTWÄSSERUNGSANLAGE FÜR STRASSEN

INSTALLATION D'EVACUATION POUR ROUTES

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IN CENTRUM VAN BREDA GEMODIFICEERDE
ZOAB-CONSTRUCTIE"

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Description

Field of the Invention

The invention relates to a drainage installation for roads, and in particular to a kerb drain and gully system. The term "roads" as used throughout the specification is intended to include roadways, highways, carriage-ways, bridges, runways and the like.

Background to the Invention

It is known to provide drainage installations for roads, which include a roadway, a pavement or verge extending along one or both sides of the road, and having a surface which is elevated relative to the surface of the road, a kerb which extends upwardly from the road surface to the pavement or verge, and an open water gulley, typically of channel shape, extending longitudinally between the road surface and the kerb, at a level below the road surface. Such drainage installations suffer from the disadvantage that because the channel is open at the top pedestrians stepping off the pavement onto the road are in danger of tripping over the channel. Cyclists are also at risk because of the danger of bicycle wheels catching in the open channel. Also, the open nature of the channels can lead to frequent blockage of the channel by debris from the road surface.

It is known to have enclosed drainage channels in or associated with a roadway kerb. For example, it is known from UK 1591332 to provide a drainage channel formed by a plurality of pre-cast concrete sections laid end to end along the roadway. Typically, the concrete sections are in the form of blocks having a drainage channel moulded in the center of the block and a cover portion containing a water inlet communicating between the top of the road surface and the channel whereby water may flow from the road surface into the drainage channel. The known pre-cast concrete kerb blocks containing an integral drainage channel are difficult and expensive to mould. Also, they are not suitable for draining road surfaces containing a top layer of porous asphalt.

DE-A-3210222 discloses a kerbstone for edging a roadway, or other surface. It has an edge piece protruding above the roadway and a base piece lying in the ground. The base piece contains a duct, extending over the kerbstone's length, with at least one lateral water inflow pipe opening out at road or surface level. The base piece can have a plinth, with a water gutter at the level of the road surface or inflow opening. Two ducts, such as plastic pipes, can be provided, each with a protrusion and a recess.

NL-A-9101642 discloses a kerbstone extending along the side of a road surface, having apertures at intervals leading to rainwater collecting chambers. The apertures are connected to the chambers by a gutter parallel to the edge of the road surface and close below it. The apertures can be less than 5 and preferably less

than 2 metres apart, there being on at least in each individual kerbstone. The surface has a top layer permeable to liquid with an impermeable one below it, the top one partly making the apertures. The kerbstone is of concrete, with the apertures curving through 90 degrees.

In modern roadway construction, the roadway comprises a road base containing layers of hard core or the like. Above, the road base is laid a dense layer of bitumen macadam, which is largely water impervious. The top surface of the roadway is comprised of a layer of porous asphalt laid over the dense layer. With this arrangement rain water percolates through the upper porous asphalt surface of the roadway through to the underlying dense bitumen macadam layer. It is necessary to provide means to remove the percolating water from between the two layers.

Object of the Invention

In accordance with one aspect it is an object of the invention to provide a kerb drain for a roadway which is simple to manufacture and install, and which is suitable for removing water either from the top surface or from a sub-surface of a roadway. In accordance with a second aspect, it is an object of the invention to provide a drainage installation for a road which is capable of removing water from a roadway at a level below the surface of the roadway.

Summary of the Invention

According to the invention a kerb drain comprises a longitudinal kerb section moulded from concrete or other similar material, the kerb having a top surface, a rear wall, and a front wall, wherein the front wall has formed therein a slot which extends longitudinally of the kerb and in which is located a pre-formed drainage channel which is keyed into the slot during moulding of the kerb, the drainage channel having in a front wall thereof a plurality of apertures through which water may enter a hollow interior of the drainage channel.

The shape of the slot which receives the drainage channel is complementary to the shape of the drainage channel such that the drainage channel fits snugly within the slot. The term "slot" is intended to embrace any longitudinal opening in the kerb suitable to receive the drainage channel preferably with an outer face of the drainage channel substantially flush with the face of the kerb section.

Thus, the slot may be a rabbet, channel-shaped opening or the like.

Suitably, the drainage channel comprises a conduit pre-fabricated from metal, plastics, concrete or other suitable material and the kerb is moulded from concrete or the like with the pre-formed conduit located in situ during the moulding process.

The conduit may be of substantially polygonal

shape in cross-section and fits into a complementary shaped rabbet formed in the front wall of the kerb section. For example, the conduit may be of rectangular cross section, open at both ends.

The invention also provides a drainage installation for roadways and the like comprising a road surface, a pavement or verge extending along one or both sides of the roadway, and a kerb located between the roadway and the pavement or verge, wherein the roadway comprises an upper porous layer which is water permeable and an underlayer which is substantially impervious to water, and the kerb is a kerb as described above and wherein the front wall of the conduit containing the apertures is located adjacent to the porous layer such that surface water percolating through the porous layer flows through the apertures and into the hollow interior of the conduit. The kerb drains are connected at intervals to junction boxes, which contain a sump, and from which accumulated water may be diverted to a main drainage system.

Brief Description of the Drawings

Some embodiments of the inventions are hereinafter described with reference to the accompanying drawings wherein:

Figure 1 is an isometric view of a drainage kerb of the invention;

Figure 2 is a front view of the drainage kerb of Figure 1;

Figure 3 is a section through the line A-A of Figure 2, to a smaller scale, and also showing a section through the adjoining roadway;

Figure 4 is a side view of a first embodiment of a junction box of invention;

Figure 5 is a front view of the junction box of Figure 4;

Figure 6 is a plan view of the junction box of Figure 4;

Figure 7 is a side view of a second embodiment of a junction box of the invention;

Figure 8 is a front view of the junction box of Figure 7;

Figure 9 is a plan view of the junction box of Figure 7;

Figure 10 is a plan view of a cover for the junction box of Figure 4 or Figure 7;

Figure 11 is a front view of the cover unit of Figure 10 and

Figure 12 is a side view, to an enlarged scale, of a locking device of the cover of Figure 10, Figure 18 or Figure 24.

Figure 13 is an isometric view of a second embodiment of a drainage kerb of the invention.

Figure 14 is a front view of Figure 13.

Figure 15 is a section through the line A-A of Figure 14 also showing a section of the adjoining roadway.

Figure 16(a) shows a side view of a junction box suitable for use with the drainage kerb of Figure 13. Figure 16(b) shows a side view of an alternate junction box suitable for use with the drainage kerb of Figure 13.

Figure 17 shows a front view of a front plate of the junction box of

Figure 16(a) or Figure 16(b).

Figure 18 is a plan view of a cover of the junction box of Figure 16(a) or 16(b).

Figure 19 is a isometric view of a third embodiment of a drainage kerb of the invention.

Figure 20 is a front view of Figure 19.

Figure 21 is a section through the line A-A of Figure 20 showing a section of the adjoining roadway.

Figure 22(a) is a side view of a junction box suitable for use with the drainage kerb of Figure 19.

Figure 22(b) is a side view of an alternate junction box suitable for use with the drainage kerb of Figure 19.

Figure 23 is a front view of a front plate of the junction box of

Figure 22(a) or 22(b).

Figure 24 shows a plan view of a cover of the junction box of Figure 22(a) or 22(b), and

Figure 25 shows a transition piece for connecting a kerb of the first embodiment with that of a third embodiment.

Detailed Description of the Preferred Embodiments

Referring to Figures 1 to 3 of the drawings, a kerb drain of the invention comprises a kerb 1 moulded from concrete or other suitable material. The kerb drain 1 is a longitudinal section comprising a top surface 2, a bevelled upper front wall portion 3, a lower wall portion 4 and a rear wall 5.

The lower wall portion 4 is formed with a longitudinal rabbet 6, which is in the form of a step-shaped rectangular channel. The rabbet 6 extends for the full length of the kerb 1 and extends inwardly of the kerb to a depth which is approximately half the width of the kerb 1. For example, if the kerb, when viewed from the end, has a width of 130 mm, the rabbet 6 has a width of 60 mm.

The rabbet 6 is adapted to receive an enclosed drainage channel in the form of a conduit 7.

In the embodiment shown, the conduit 7 is substantially rectangular, in cross-section, and comprises a top wall 8, a bottom wall 9, a rear wall 10 and a front wall 11. It will be appreciated that the rearwall 10 and/or the bottom wall 9 of the conduit 7 could be omitted in which case the conduit 7 would be of open-channel shape or L-shape in cross-section. In that event, the top and side walls defining the rabbet 6 would co-operate with the walls of the conduit 7 to form a drainage channel.

The front wall 11 of the conduit 7 is formed with a plurality of slots 12 at spaced intervals along the length of the wall. The slots 12 form apertures through the wall

through which water may flow into a hollow interior of the conduit 7.

The conduit 7 is keyed into the rabbet 6 by means of ties 13 which are fixed to and project from the rear wall 10 of the conduit 7 and extend into the concrete of the kerb 1. Suitably, the ties 13 are in the shape of fish tails. When inserted in the rabbet 6, the front wall of the conduit 7 is flush with the front wall portion 4 of the kerb 7.

In this embodiment the conduit 7 is fabricated from galvanised mild steel from which it is pressed, and slotted to form the slots 12. For example, the conduit 7 may be made from 4-6 mm mild steel. Alternatively, channel 7 can be made from metal alloy, cast-iron, plastics, concrete or other suitable material. In the embodiment shown the conduit 7 is of a rectangular cross-section, but it could be of square, circular, c-shaped or other cross-section.

The ties 13 are welded to the rear wall 10 of the conduit 7 at spaced intervals. To manufacture the kerb 1, the conduit 7 is placed into a mould having the shape of the kerb 1. Concrete, for example 25 newtons, air-entrained concrete, is poured into the mould in well known manner and allowed to cure. In this way, the kerb 1 is cast with the conduit 7 located in situ.

The positioning of the kerb 1 relative to a roadway 14 and a pavement or verge 15 is illustrated with reference to Figure 3.

As shown in Figure 3, the roadway 14 comprises an upper porous surface layer 16 of asphalt, which is laid on an underlying dense layer 17 which is substantially impervious to water. The dense layer 17 is supported on a road base 18 formed from hard core or the like. The pavement or verge 15 extends along one or both sides of the roadway 14, and has a surface which is elevated relative to the surface of the road. The kerb 1 extends upwardly from the road surface 14 and abuts the edge of the pavement 15.

As shown in Figure 3, the rear wall 5 of the kerb 1 abuts the pavement 15, and the upper wall portion 3 and the lower wall portion 4 face the roadway. The conduit 7 is located substantially below the road surface. The upper portion of the front wall 11 of the conduit 7, which contains the slots 12, is located adjacent to the porous surface layer 16 of the roadway. A lower, closed, portion of the wall 11 is located adjacent to the intermediate dense layer 17 of the roadway. Thus, water such as rain-water falling on the upper surface of the roadway 14, percolates downwardly through the porous layer 16 and flows through the slots 12 into the hollow interior of the conduit 7.

The number, spacing and size of the slots 12 is of importance. Thus, it is of importance that the slots 12 communicate with the porous asphalt layer 16 and also communicate with the joint between the layer 16 and the intermediate dense layer 17 so that all water percolating through the upper porous layer 16 is collected in the conduit 7. If desired, an upper portion of the slotted part of

the wall 11 may be positioned above the surface of the roadway 14 to facilitate collection of surface water. It is important that the width of the slots 12 is less than the average diameter (particle size) of the stone chips which are used in forming the porous asphalt surface layer 16. In a typical arrangement, the chips used in forming the surface layer 16 have a minimum size of 20 mm. The slots 12 are 10 mm in width and 52 mm in height. The slots are spaced apart at 10 mm intervals. Thus, should the stone chips forming the upper surface layer 16 of the roadway become loose, they cannot enter through the slots 12. The unslotted portion of the wall 11, which portion typically has a height of 84 mm, is of importance to prevent chips or particles from the layers 16, 17 from entering into the interior of the conduit 7.

The kerbs 1 are laid end to end along the side of the roadway. To facilitate laying of the kerbs 1 the conduit 7 projects a short distance, typically 6 mm, from each end of the concrete kerb 1 as shown in Figure 1. Thus, when the kerbs 1 are laid end to end the projecting portions 19 of the conduit 7 act as spacers to create a gap between adjoining kerbs 1. These gaps are filled with grout to seal the joint between the kerb sections. To facilitate laying of the kerbs 1, a seating plate 20 is attached to one end of the bottom wall 9 of the conduit 7 and projects laterally therefrom. The seating plate 20 facilitates levelling of adjoining kerbs 1.

A drainage installation for collecting surface water from the conduit 7 and directing the accumulated water into a main drainage system will now be described with reference to Figures 4 to 6 of the accompanying drawings.

As described above, a plurality of kerbs 1 of the invention are laid end to end along the roadway. Junction boxes 21 are connected to the kerb 1 at intervals, which may vary from about 10 meter intervals to 30 meter intervals depending on the expected water flow. As shown in Figure 4, the junction box 21, has, in an upper corner thereof, an inlet section 22 which, in cross-section, is of substantially the same shape as the kerb 1. The junction box 21 is buried in the ground to a depth such that inlet section 22 abuts adjoining kerbs 1. The inlet section 22 suitably is made from metal. The remainder of the junction box may be moulded from concrete, plastics or the like. It could also be fabricated from glass reinforced plastics. The inlet section 22 includes an inlet 23 which corresponds in size and shape to the conduit 7 and connects with the conduit 7. Thus, water from the conduit 7 flows into the inlet 23 and from there into the interior of the junction box 21. The junction box 21 has a hollow interior 24 including a lower sump 25. The junction box 21 is provided with an outlet 26, a lower portion of which is positioned just below the level of the inlet 23. The outlet 26 is adapted to receive a connector pipe (not shown) which is connected to the main drainage system.

In use, water collected in the slotted conduit 7 flows along the conduits 7 until it reaches one of the junction boxes 21. The water from the conduit 7 enters the inlet

23 and flows into the sump 25. When the water rises in the sump 25 to the level of the outlet 26 it flows out through the outlet 26 into the connector pipe to the main drainage system.

Silt or other debris which succeeds in entering the conduit 7 is collected at the bottom of the sump 25 from which it may be removed periodically.

The junction box 21 is formed with a cover 27. Suitably, the cover 27 is fabricated from 4 mm galvanised mild steel with an anti-slip top surface. The cover has a flat top portion 28 which is aligned with the surface of the pavement 15. A front portion 29 of the cover 27 is bent to a profile which corresponds with the front profile of the kerb 1. The cover 27 is shown in more detail in Figures 10 to 12. As shown in Figure 10, the top 28 is provided with two locks 30. The construction of the lock 30 is illustrated in Figure 12. Each lock 30 comprises a rotatable bolt 31 which is journaled in upper and lower bearings 32 contained in a frame 33 welded to the underside of the top 28 of the cover 27. The bolt 31 has a bolt head 34 by means of which the bolt 31 may be rotated by a suitable key or wrench, for example an allen key. The bolt head 34 is recessed within the top 28. The bolt has, at its lower end, a foot 35 which projects at right angles from the bolt. When the bolt is in the closed position the foot 35 engages in a slot 36 formed in the side wall at the junction box 21. To open the lock the bolt 31 is rotated to disengage the foot 35 from the slot 36, whereupon the cover 27 may be lifted off the junction box 21.

When the cover 27 is removed access may be gained to the hollow interior 24 of the junction box 21. This facilitates removal of accumulated debris in the sump 25. It also permits the conduits 7 to be cleaned by means of rods, in a well known manner. The rods may be inserted into the inlet 23 and from there into the adjoining conduits 7, to remove silt or other debris which may have accumulated in the conduits 7.

The junction box illustrated in Figures 7 to 9 is substantially the same in construction as that of Figures 4 to 6, and like numerals denote like parts. The main difference is that in the embodiment of Figures 4 to 6, the outlet 26 is located in the rear wall of the junction box, whereas in the embodiment of Figures 7 to 9, the outlet 26 is located in the front wall of the junction box.

A second embodiment of a kerb drain of the invention will now be described with reference to Figures 13 to Figure 20. Similar reference numerals are used to describe similar parts to that of the first embodiment described.

The kerb shown and described in Figures 13 to 15 is generally similar in construction to the kerb 1 described with reference to Figures 1 to 3, except that the slots 12 are positioned at a higher location in the kerb, such that in use the slots are adjacent the surface layer of the roadway, and are thus suitable for removing surface water from a roadway 14. Many roadways do not have a semi-permeable top layer and thus water is re-

tained on the surface layer 16 of the road.

The kerb 1 of this embodiment has a top surface 2 and a bevelled upper front wall portion 3. The conduit 7 is substantially rectangular, in cross section and again comprises a top wall 8, a bottom wall 9, a rear wall 10 and a front wall 11. The rear wall 10 and the front wall 11 are substantially longer than the side walls 8 and 9 thus giving the conduit 7 an overall elongate rectangular shape. In particular the conduit 7 extends vertically close to the top surface 2 of the kerb 1.

The conduit 7 also has attached a toe plate 37. The toe-plate 37 is an extended part of the conduit which extends above the top wall 8 of the conduit 7 and follows the profile of the bevelled upper front wall portion 3 of the kerb. The toe plate 37 extends laterally along the entire length of the conduit 7 and the kerb 1. The toe plate protects the front wall 3 from chipping and other damage. It also serves in locating the conduit accurately in the rabbet 6 during moulding of the kerb 1, and helps in strengthening the construction.

The top corner portion of the front wall 11 of the conduit 7 is bevelled to conform to the shape of the bevelled front wall 3 of the kerb. The corner between top wall 8 and front wall 11 is thus defined by an angled portion 38. The slots 12 are formed in the bevelled portion of the front wall 11 of the conduit 7. The result is that ribs 39 between the slots 12 also have an angled profile, and the slots 12 lie in the bevelled plane.

As shown in Figure 15, the kerb 1 is fitted between a roadway 14 and a path or verge 15. As in the previous embodiment, the roadway 14 is composed of three layers. Firstly there is the road base 18, an intermediate dense layer 17 and an upper impervious layer 40. The kerb is fitted in place so that the angled portion 38 of the conduit 7 and begins just above the upper impervious layer 40. Therefore the slots 12 are above the surface of the impervious layer 40 and surface water runs off the upper layer 40 through the slots 12 and into the conduit 7 as described previously.

The toe plate 37 is provided with a stiffener 41 which strengthens the toe plate 37. The stiffener 41 does not extend laterally along the toe plate 37 but instead a number of stiffeners 41 are provided at intervals along toe plate 37. The rabbet 6 in the kerb 1 is suitably shaped at the top thereof to accommodate the bevelled shape of the toe plate 37, such that it is flush with the wall 3. A junction box 21 suitable for use with the kerb 1 of Figure 13 is now described with reference to Figures 16 to 18. The junction box 21 has, in an upper corner thereof, an inlet section 22 which, in cross section is of substantially the same shape as the kerb 1 of Figure 13. The junction box 21 functions in exactly the same way as described for the previous embodiment. Figures 16(a) and 16(b) show two alternate arrangements whereby the outlet 26 is provided in the rear wall and front wall of the junction box respectively. The junction box 21 has a cover 27 which has a flat top portion 28 and a front portion 29.

With reference to Figures 17 and 18 of the draw-

ings, a cover 27 for the junction box is comprised of a flat top portion 28 and a front plate 29. The top 28 is provided with a locking arrangement 30 which functions as described previously with reference of Figure 12. The top 28 is provided with a lip 42 which extends over the front plate 29 when the junction box is assembled.

A third embodiment of the invention is now described with reference to Figures 19 to 24 of the drawings.

The kerb 1 shown in Figure 19 is a low profile kerb being of substantially shorter vertical height than the kerbs of the two embodiments described previously. In particular the conduit 7 again is of a different cross-sectional shape. In particular the vertical, front wall 11 and rear wall 10 of the conduit are shorter than the transverse walls 8 and 9. Furthermore front wall 11 is higher than rear wall 10. Top wall 8 thus slopes downwardly from where it meets front wall 11 to where it joins rear wall 10. The cross-section of the conduit 7 thus retains its volume capacity for water while being substantially reduced in height.

The conduit 7 is fitted with a toe plate 37 which is similar in construction, and serves the same function as that described above in relation to Figures 13 to 15. Similarly, slots 12 are provided in the conduit 7 on the front wall 11.

The kerb 1 of this embodiment is particularly designed to be used where a reduced height difference between a roadway and a elevated surface is required for instance between a roadway and a roundabout, or an island, or a path. The kerb 1 may also be used where the kerb is positioned in front of gateways, at pedestrian crossings and the like.

While the overall vertical height of the kerb 1 is substantially reduced, the strength of the kerb is not affected as the sloping of the top wall 8 allows sufficient amount of the composite material of kerb 1 above the conduit 7 to give the kerb 1 sufficient strength.

This third embodiment of the kerb may be used either where the slots 12 are located at a level beneath the surface level of a roadway where the roadway has an upper porous surface. Alternatively it may be used where the slots 12 are located at a level above the level of a roadway where the upper surface is comprised of a non-porous material and the surface water runs off the top surface of the roadway. Figure 21 shows the third embodiment in place between a roadway and a pathway. Stiffeners 41 are provided on the toe plate 37. As can be seen from Figure 21 the toe plate 37 follows the profile of the kerb 1 and the outer surface of the toe plate 37 is flush with the surface of the kerb.

Figures 22(a) and 22(b) show alternate junction boxes 21 suitable for use with the kerb 1 of the third embodiment. Each junction box 21 has a similar cross-sectional shape to the kerb 1 and function in a manner exactly analogous to the junction boxes described previously.

The cover 27 again comprises a front portion 29 and

a top portion 28. The cover portion 28 and the front portion 29 fit onto the junction box 21 again as described previously. The locking arrangement 30 is as described previously and is used to hold the cover 27 in place.

It may be necessary to use more than one version of the kerbs described above intermittently. For instance if the roadway surface changes from it being porous to non-porous, or if the height of the kerb must be adjusted for instance to allow for a gateway or pedestrian crossing etc. In this case a transition piece or kerb 41 as shown in Figures 25 may be used. The term "transition" as used here refers to a kerb which is adapted at its opposite ends to accommodate different types of kerb. This transition kerb may be used to connect a taller kerb of the embodiment of Figure 1 to a low profile kerb of the embodiment of Figure 19. The transition kerb may also be used where for instance the top surface layer of the roadway changes from being permeable to being non-permeable or vice versa and where different versions of the kerb are used. The transition kerb contains a conduit 42 which interconnects with the conduits 7 of the adjacent kerbs and thus ensures a continuous channel for drainage water. The top surface 43 of the transition kerb is sloped so as to be flush with the top surface of each of the adjacent kerbs 1. An alternative version of the transition kerb 41 joins a low profile kerb to a higher one, the slope of top surface 43 being reversed. The conduit 42 may optionally contain slots to collect drainage water. The top surface 43 of the transition kerb is sloped so as to be flush with the top surface of each of the adjacent kerbs 1.

In the drawings the various embodiments of kerb drains of the invention are shown as straight sections. It will be appreciated however, that the kerb drains may be curved and/or mitred for use with roundabouts and other curved or circular roadway verges. Also the kerb drain sections may vary in length.

Claims

1. A kerb drain comprising a longitudinal kerb section (1) moulded from concrete or similar material, the kerb (1) having a top surface (2), a rear wall (5), and a front wall portion (4), wherein the front wall portion (4) has formed therein a slot (6) which extends longitudinally of the kerb (1) and in which is located a pre-formed drainage channel (7) which is keyed into the slot (6) during moulding of the kerb (1), the drainage channel (7) having in a front portion (11) thereof a plurality of apertures (12) through which water may enter a hollow interior of the drainage channel (7).
2. A kerb drain as claimed in Claim 1 characterised in that the drainage channel comprises a conduit (7) pre-fabricated from metal, plastics, concrete or other suitable material and the kerb (1) is moulded from

concrete or the like with the pre-formed conduit (7) located in situ during the moulding process.

3. A kerb drain as claimed in any of the preceding claims characterised in that the conduit (7) is of substantially polygonal shape in cross-section and fits into a rabbet (6) formed in the front wall of the kerb section (1).
4. A kerb drain as claimed in any of the preceding claims characterised in that the kerb section (1) has a bevelled front wall portion (3).
5. A kerb drain as claimed in Claim 4 characterised in that the pre-formed drainage channel (7) has an upwardly extending plate (37) which is shaped to conform to the bevelled shape of the front wall portion (3) of the kerb section (1) and is moulded into said wall portion so as to be flush therewith.
6. A drainage installation for roadways and the like comprising a roadway (14), a pavement or verge (15) extending along one or both sides of the roadway, and a kerb (1) located between the roadway (14) and the pavement or verge (15) wherein the roadway comprises an upper porous layer (16) which is water permeable and an underlay (17) which is substantially impervious to water, characterised in that the kerb (1) is a kerb drain as claimed in any of the preceding claims.
7. A drainage installation as claimed in Claim 6, characterised in that the apertures (12) are located adjacent to the porous layer (16) such that surface water percolating through the porous layer flows through the apertures (12) and into the hollow interior of the channel (7).
8. A drainage installation as claimed in Claim 6 or Claim 7 characterised in that a plurality of kerb drains (1) are laid end to end along the roadway and are connected at intervals to junction boxes (21), which contain a sump (25), and from which accumulated water may be diverted to a main drainage system.
9. A drainage installation as claimed in any of Claims 6 to 8 characterised in that the porous layer (16) contains stone chips and the size of the apertures (12) is less than the average particle size of the stone chips such that the stone chips may not pass through the apertures (12).
10. A drainage installation as claimed in Claim 8, characterised in that the junction boxes have an inlet (23) which corresponds substantially in size and shape to the conduit (7) and connects with the conduit (7).

11. A drainage installation as claimed in any of Claims 6 to 10, characterised in that the kerb drains (1) in one section of the roadway (14) are of a different height to those in another section, and a transition kerb (41) is provided to join the two sections of kerb, the transition kerb (41) having a conduit (42) which connects to the conduits (7) of adjacent kerbs.

Patentansprüche

1. Ein Bordkanten-Ableitungskanal, welcher einen langgestreckten Bordkantenabschnitt (1) aufweist, welcher aus Beton oder aus einem ähnlichen Material geformt ist, wobei die Bordkante (1) eine obere Seite (2), eine hintere Wand (5) und einen vorderen Wandbereich (4) aufweist, wobei der vordere Wandbereich (4) einen hierin ausgebildeten Schlitz (6) aufweist, welcher sich in Längsrichtung der Bordkante (1) erstreckt und in welchem ein vorgeformter Entwässerungskanal (7) angeordnet ist, welcher während des Formens der Bordkante (1) in dem Schlitz (6) befestigt wird, und wobei der Entwässerungskanal (7) in einem vorderen Bereich (11) von ihm eine Mehrzahl von Öffnungen (12) aufweist, durch welche Wasser in einen hohlen Innenraum des Entwässerungskanals (7) eintreten kann.
2. Ein Bordkanten-Ableitungskanal, wie in Anspruch 1 beansprucht, **dadurch gekennzeichnet**, daß der Entwässerungskanal eine Leitung (7) aufweist, die aus Metall, Kunststoffen, Beton oder einem anderen geeigneten Material vorgefertigt ist, und daß die Bordkante (1) aus Beton oder dergleichen geformt ist, wobei die vorgeformte Leitung (7) an Ort und Stelle während des Formungsprozesses angeordnet wird.
3. Ein Bordkanten-Ableitungskanal, wie in einem der vorhergehenden Ansprüche beansprucht, **dadurch gekennzeichnet**, daß die Leitung (7) im Querschnitt von einer im wesentlichen polygonalen Gestalt ist und in eine Nut (6) paßt, die in der vorderen Wand des Bordkantenabschnitts (1) ausgebildet ist.
4. Ein Bordkanten-Ableitungskanal, wie in einem der vorhergehenden Ansprüche beansprucht, **dadurch gekennzeichnet**, daß der Bordkantenabschnitt (1) einen abgeschrägten vorderen Wandbereich (3) aufweist.
5. Ein Bordkanten-Ableitungskanal, wie in Anspruch 4 beansprucht, **dadurch gekennzeichnet**, daß der vorgeformte Entwässerungskanal (7) eine sich nach aufwärts erstreckende Platte (37) aufweist, welche so gestaltet ist, um sich an die abgeschrägte Gestalt des vorderen Wandbereichs (3) des Bordkantenabschnitts (1) anzupassen, und welche so in

den genannten Wandbereich geformt ist, daß sie mit diesem fluchtet.

6. Eine Entwässerungsanlage für Fahrdämme und dergleichen, aufweisend: einen Fahrdamm (14), einen Gehsteig oder ein Bankett (15), der oder das sich entlang einer oder beider Seiten des Fahrdammes erstreckt, und eine Bordkante (1), die zwischen dem Fahrdamm (14) und dem Gehsteig oder dem Bankett (15) angeordnet ist, wobei der Fahrdamm eine obere poröse Schicht (16), welche wasser-durchlässig ist, und eine Unterlage (17) aufweist, welche für Wasser im wesentlichen undurchlässig ist, **dadurch gekennzeichnet**, daß die Bordkante (1) ein Bordkanten-Ableitungskanal ist, wie in einem der vorhergehenden Ansprüche beansprucht.
7. Eine Entwässerungsanlage, wie in Anspruch 6 beansprucht, **dadurch gekennzeichnet**, daß die Öffnungen (12) in Nachbarschaft zu der porösen Schicht (16) in der Weise angeordnet sind, daß durch die poröse Schicht durchsickerndes Oberflächenwasser durch die Öffnungen (12) und in den hohlen Innenraum des Kanals (7) fließt.
8. Eine Entwässerungsanlage, wie in Anspruch 6 oder Anspruch 7 beansprucht, **dadurch gekennzeichnet**, daß eine Mehrzahl von Bordkanten-Ableitungskanälen (1) entlang des Fahrdammes End-zu-Ende gelegt und absatzweise mit Anschlußkästen (21) verbunden ist, welche einen Einlaufschacht (25) enthalten und von welchen angesammeltes Wasser zu einem Hauptentwässerungssystem abgeleitet werden kann.
9. Eine Entwässerungsanlage, wie in einem der Ansprüche 6 bis 8 beansprucht, **dadurch gekennzeichnet**, daß die poröse Schicht (16) Splitt enthält und die Größe der Öffnungen (12) geringer als die durchschnittliche Teilchengröße des Splitts ist, derart, daß der Splitt nicht durch die Öffnungen (12) gehen kann.
10. Eine Entwässerungsanlage, wie in Anspruch 8 beansprucht, **dadurch gekennzeichnet**, daß die Anschlußkästen einen Einlaß (23) aufweisen, welcher in der Größe und in der Gestalt der Leitung (7) entspricht und eine Verbindung mit der Leitung (7) herstellt.
11. Eine Entwässerungsanlage, wie in einem der Ansprüche 6 bis 10 beansprucht, **dadurch gekennzeichnet**, daß die Bordkanten-Ableitungskanäle (1) in einem Abschnitt des Fahrdammes (14) eine gegenüber denjenigen in einem anderen Abschnitt unterschiedliche Höhe aufweisen und daß eine Übergangsbordkante (41) vorgesehen ist, um die zwei Abschnitte der Bordkante zu verbinden, wobei

die Übergangsbordkante (41) eine Leitung (42) aufweist, welche die Leitungen (7) von benachbarten Bordkanten verbindet.

Revendications

1. Bordure d'évacuation comprenant un tronçon de bordure longitudinal (1), moulé à partir de béton ou d'un matériau similaire, la bordure (1) comprenant une surface supérieure (2), une paroi postérieure (5) et une partie de paroi antérieure (4), une encoche (6) étant formée dans la partie de paroi antérieure (4), encoche qui s'étend dans le sens longitudinal de la bordure (1) et dans laquelle est placé un canal d'évacuation (7) préformé qui est claveté dans l'encoche (6) pendant le moulage de la bordure (1), le canal d'évacuation (7) comportant dans sa partie avant (11) une pluralité d'orifices (12) par lesquels l'eau peut pénétrer à l'intérieur du canal d'évacuation (7).
2. Bordure d'évacuation selon la revendication 1, caractérisée en ce que le canal d'évacuation comprend un conduit pré-fabriquée (7), en métal, matière plastique, béton ou autre matériau approprié, et la bordure (1) est moulée à partir de béton ou équivalent alors que le conduit pré-fabriquée (7) est disposé in situ pendant l'opération de moulage.
3. Bordure d'évacuation selon l'une quelconque des revendications précédentes, caractérisée en ce que le conduit (7) a une section de forme sensiblement polygonale et s'emboîte dans une feuillure (6) formée dans la paroi antérieure du tronçon de bordure (1).
4. Bordure d'évacuation selon l'une quelconque des revendications précédentes, caractérisée en ce que le tronçon de bordure (1) comprend une partie (3) de sa paroi antérieure qui est biseautée.
5. Bordure d'évacuation selon la revendication 4, caractérisée en ce que le conduit d'évacuation préfabriquée (7) comprend une plaque (37) s'étendant vers le haut, dont la forme correspond à la forme biseautée de la partie de paroi antérieure (3) du tronçon de bordure (1) et qui est moulée dans ladite partie de paroi pour être affleurante avec elle.
6. Installation d'évacuation pour les routes ou équivalent, comprenant une chaussée (14), un trottoir ou banquette (15) qui s'étend le long d'un côté de la chaussée ou des deux, et une bordure (1) placée entre la chaussée (14) et le trottoir ou banquette (15), dans laquelle la chaussée comprend une couche supérieure (16), poreuse, qui est perméable à l'eau, et une sous-couche (17) qui est sensiblement

imperméable à l'eau, caractérisée en ce que la bordure (1) est une bordure d'évacuation selon l'une quelconque des revendications précédentes.

7. Installation d'évacuation selon la revendication 6, caractérisée en ce que les orifices (12) sont disposés pour être adjacents à la couche poreuse (16) de sorte que l'eau de surface qui passe à travers la couche poreuse s'écoule, par les orifices (12), dans l'intérieur creux du canal (7). 5
10

8. Installation d'évacuation selon la revendication 6 ou la revendication 7, caractérisée en ce que plusieurs bordures d'évacuation (1) sont disposées bout-à-bout le long de la chaussée et sont accouplées à intervalles réguliers à des coffrets de jonction (21) qui contiennent un puisard (25) et depuis lesquels l'eau accumulée peut être détournée vers un réseau d'égout. 15
20

9. Installation d'évacuation selon l'une quelconque des revendications 6 à 8, caractérisée en ce que la couche poreuse (16) contient des gravillons et la taille des orifices (12) est inférieure à la taille moyenne des gravillons, de sorte que les gravillons ne peuvent pas passer par les orifices (12). 25

10. Installation d'évacuation selon la revendication 8, caractérisée en ce que les coffrets de jonction ont une entrée (23) qui correspond sensiblement en taille et en forme au conduit (7) et qui se raccorde au conduit (7). 30

11. Installation d'évacuation selon l'une quelconque des revendications 6 à 10, caractérisée en ce que les bordures d'évacuation (1) ont, dans une partie (14) de la chaussée, une hauteur différente de celles d'une autre partie, et en ce qu'une bordure de transition (41) est utilisée pour réunir les deux tronçons de bordure, la bordure de transition (41) comprenant un conduit (42) qui s'accouple aux conduits (7) des bordures adjacentes. 35
40

45

50

55

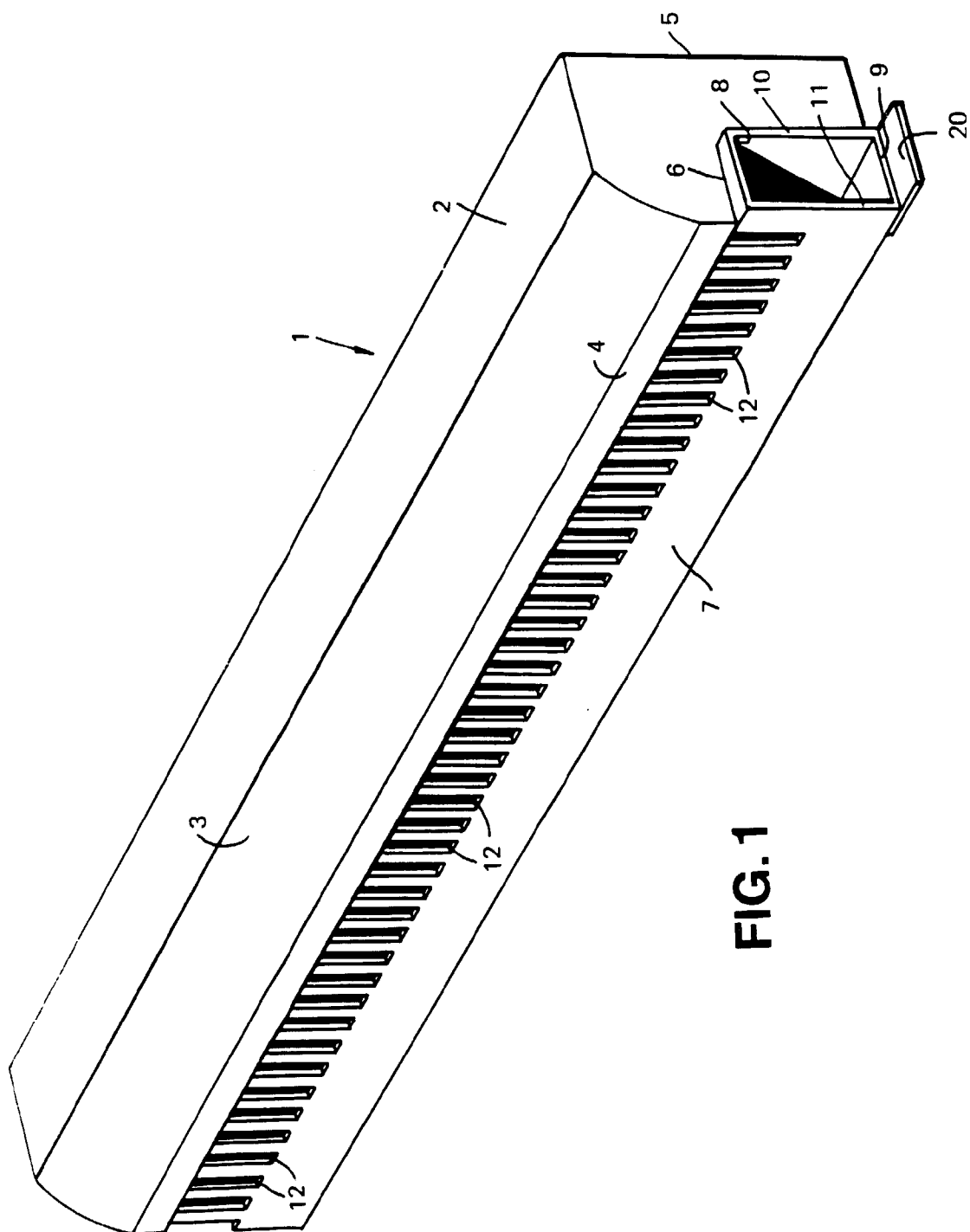


FIG. 1

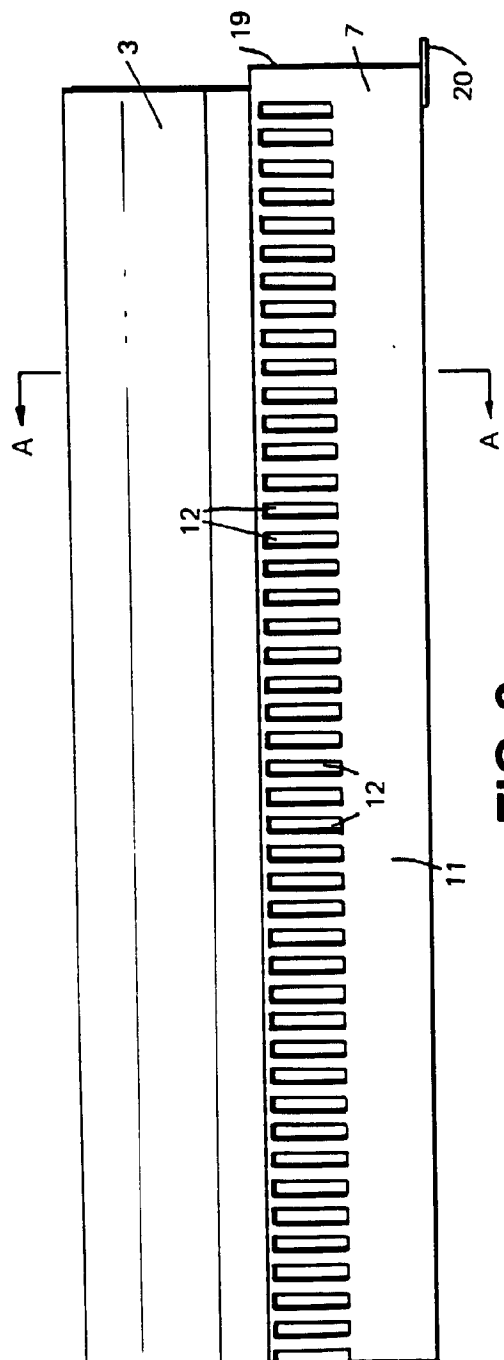


FIG. 2

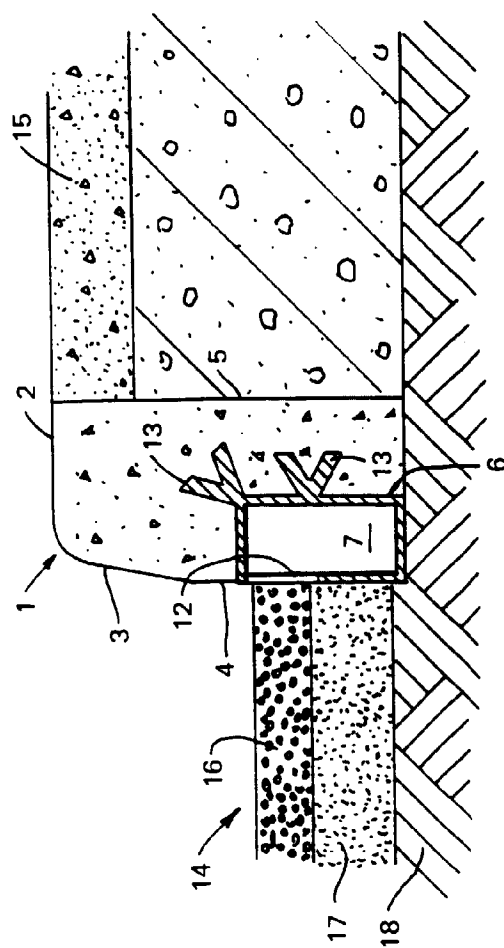


FIG. 3

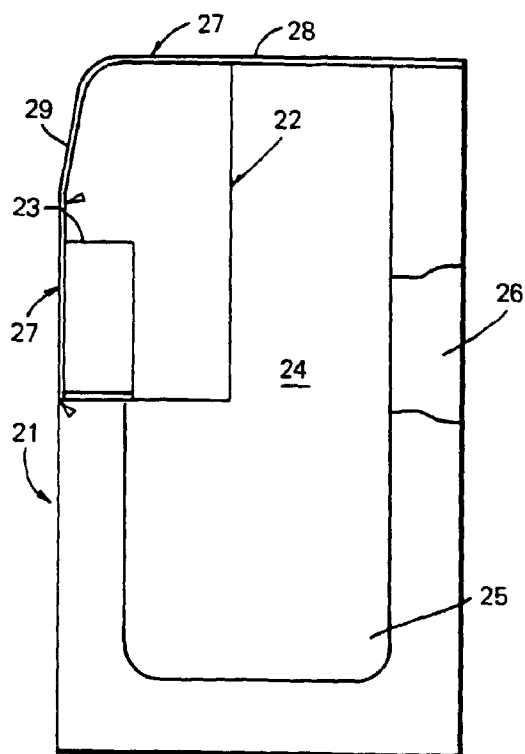


FIG. 4

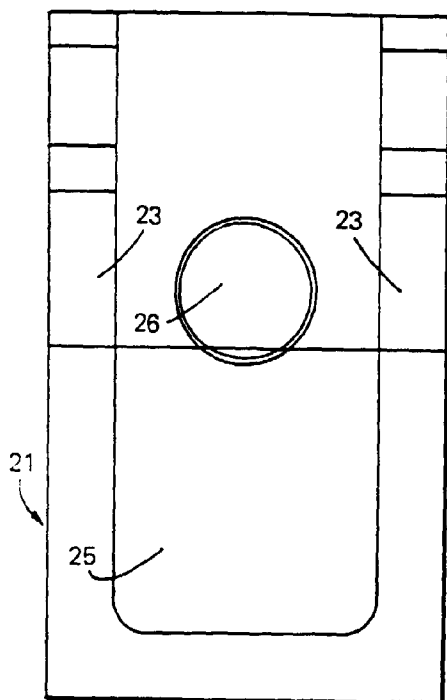


FIG. 5

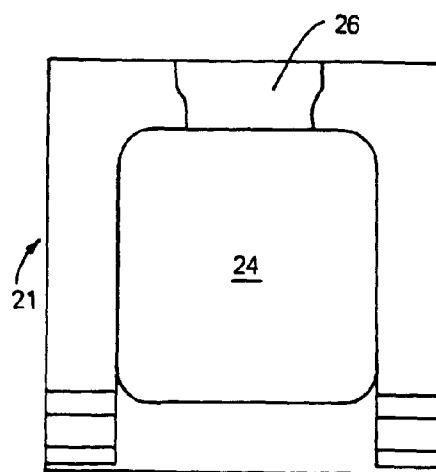


FIG. 6

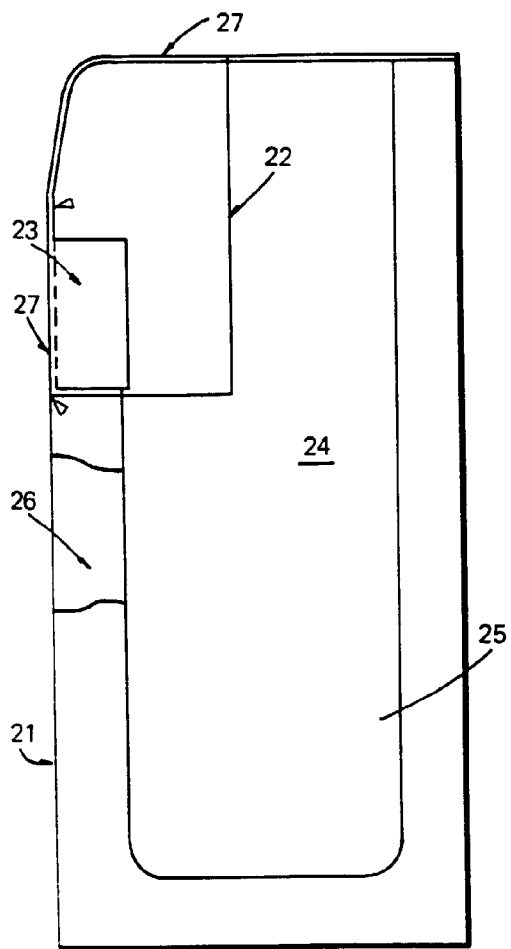


FIG. 7

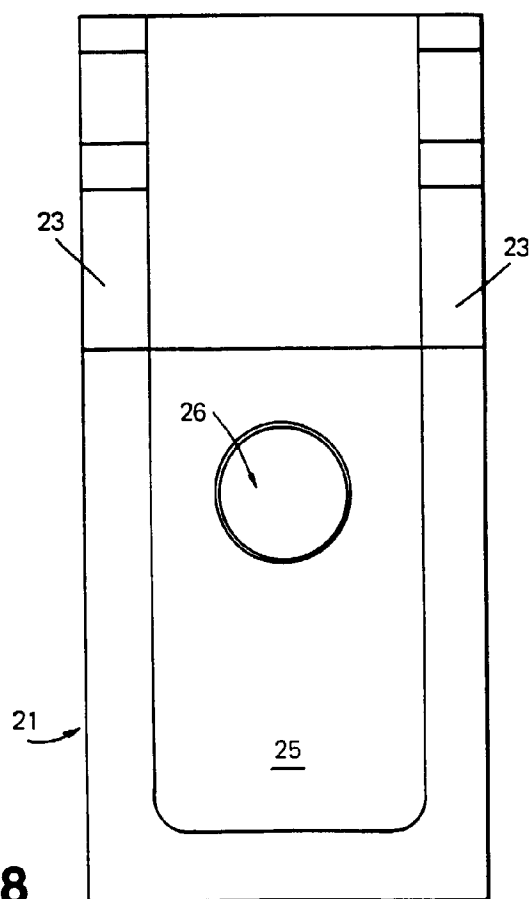


FIG. 8

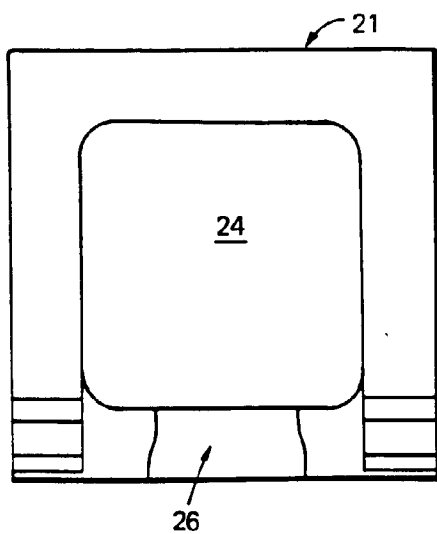


FIG. 9

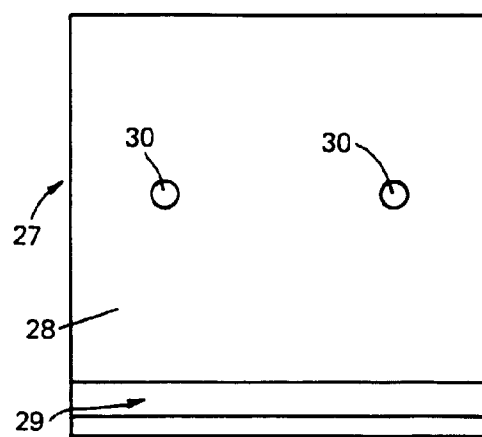


FIG. 10

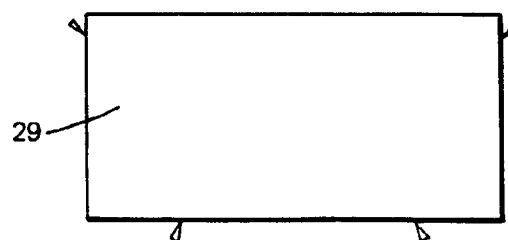


FIG. 11

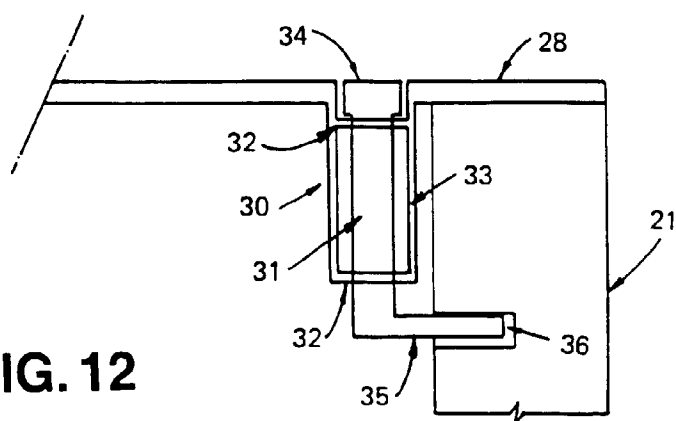


FIG. 12

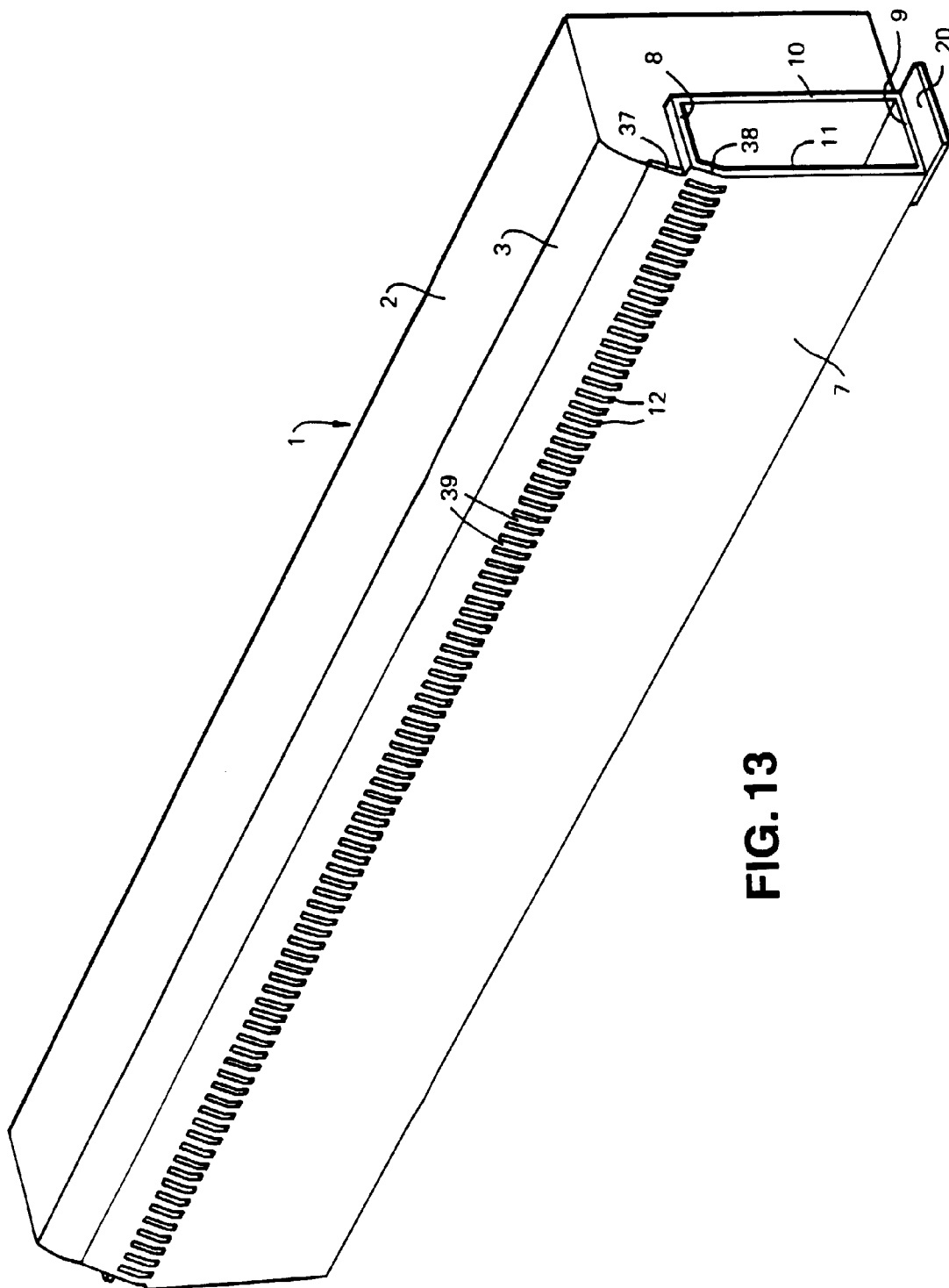


FIG. 13

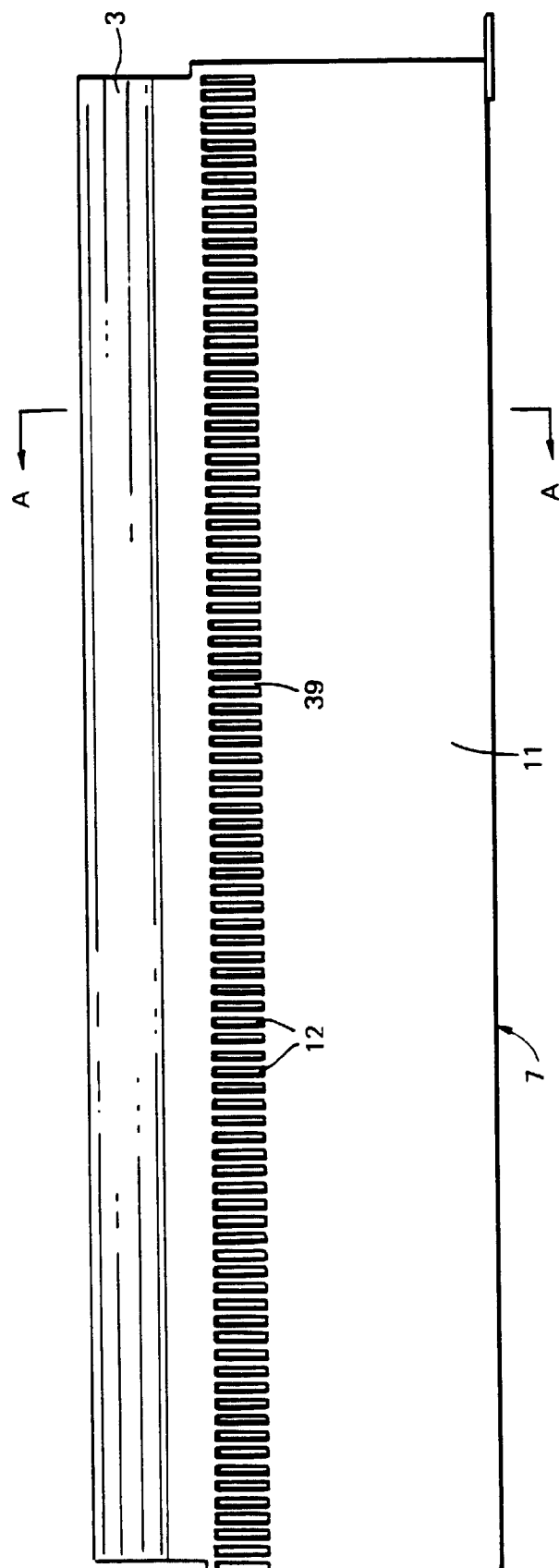


FIG. 14

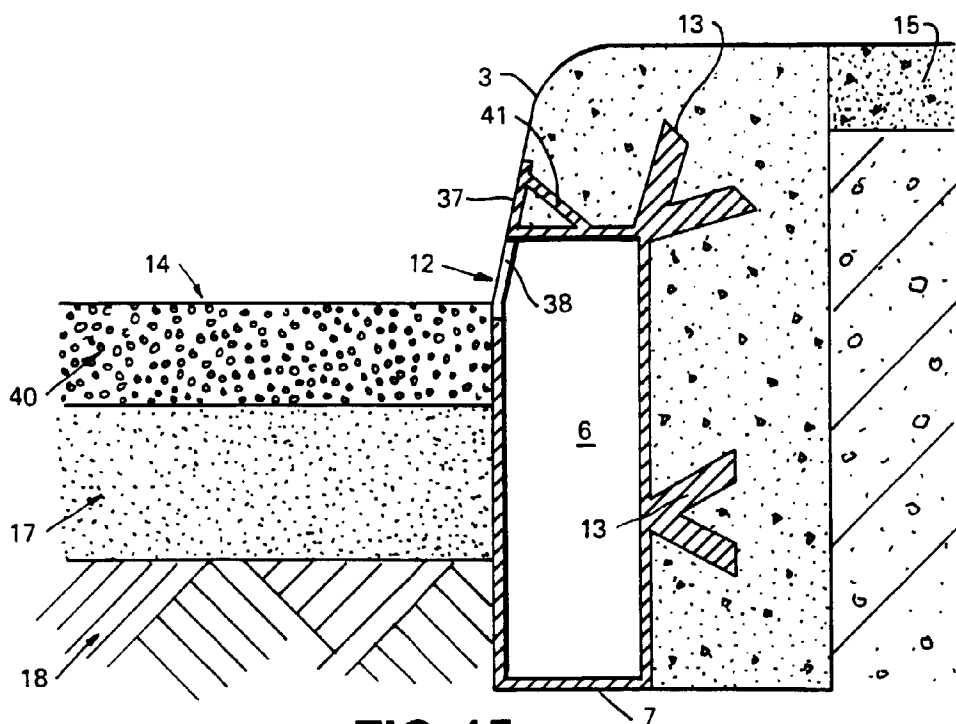


FIG. 15

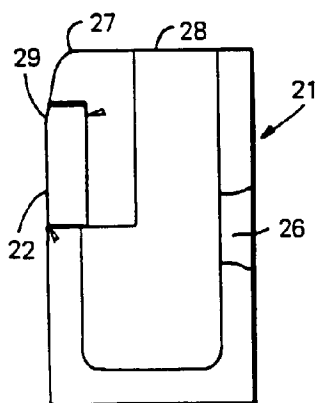


FIG. 16a

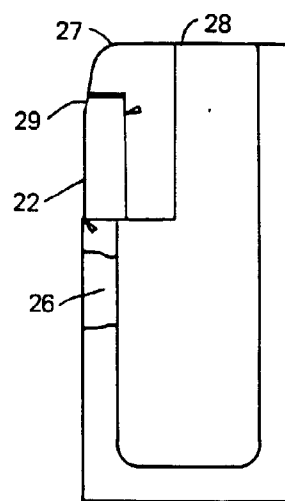


FIG. 16b

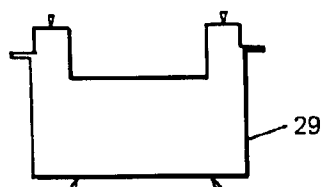


FIG. 17

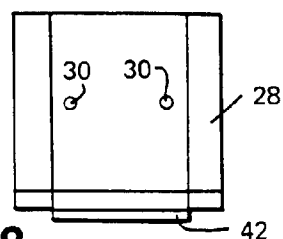


FIG. 18

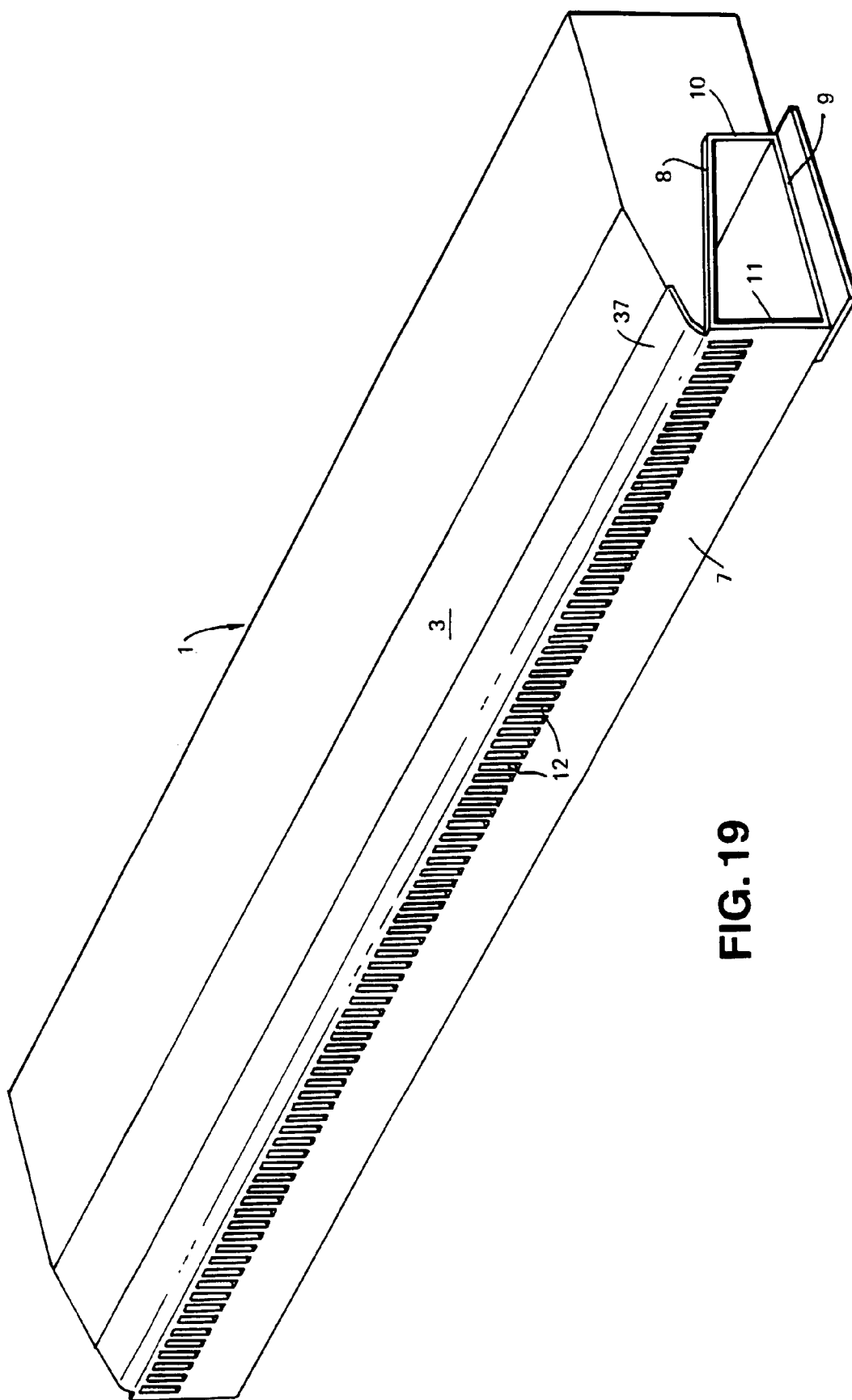


FIG. 19

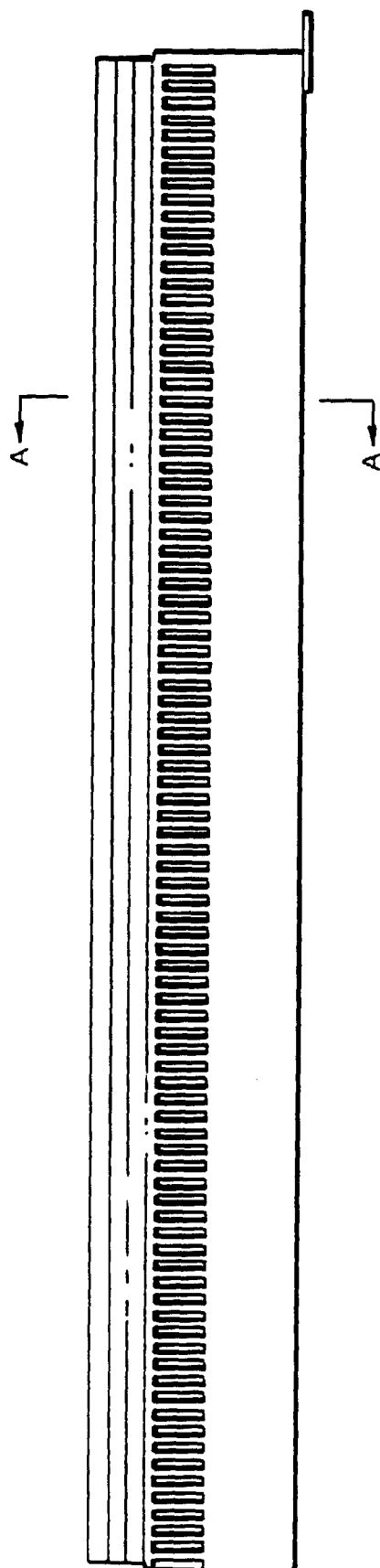


FIG. 20

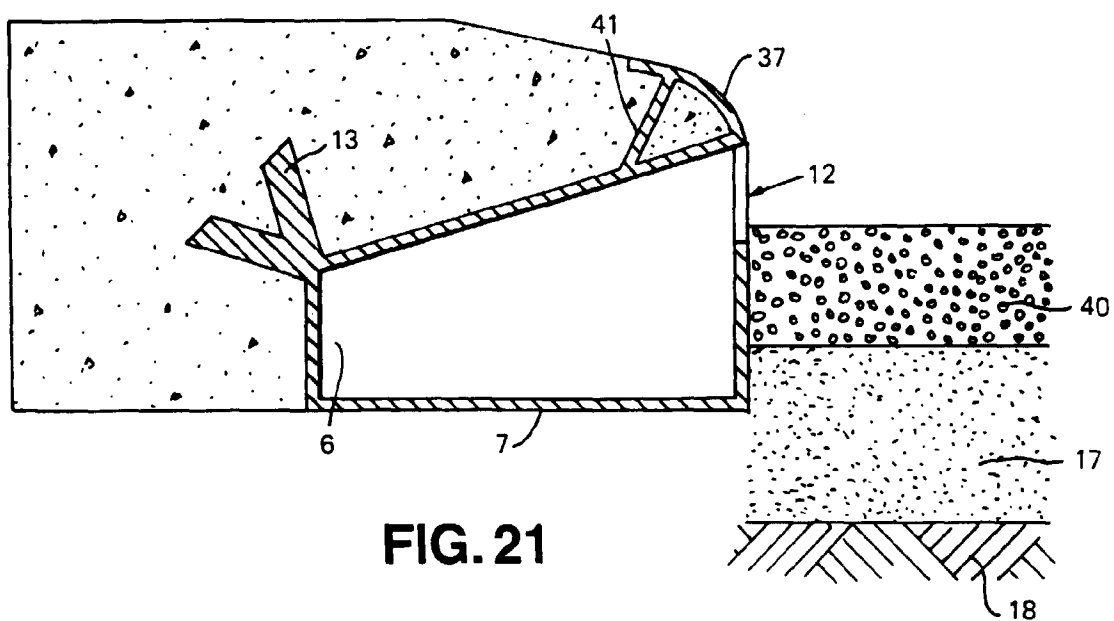


FIG. 21

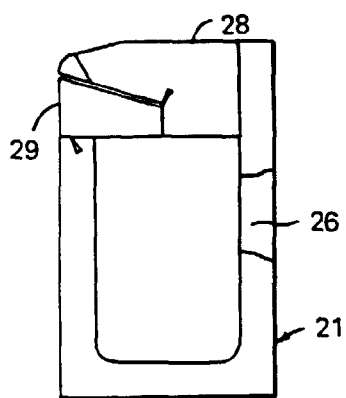


FIG. 22a

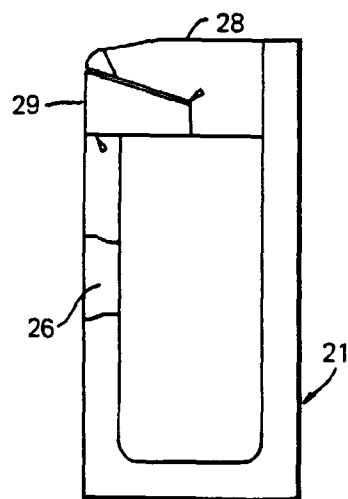


FIG. 22b

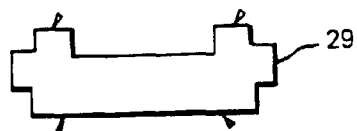


FIG. 23

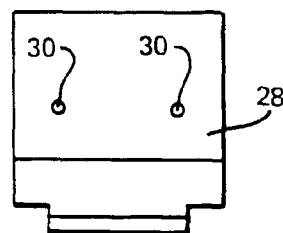


FIG. 24

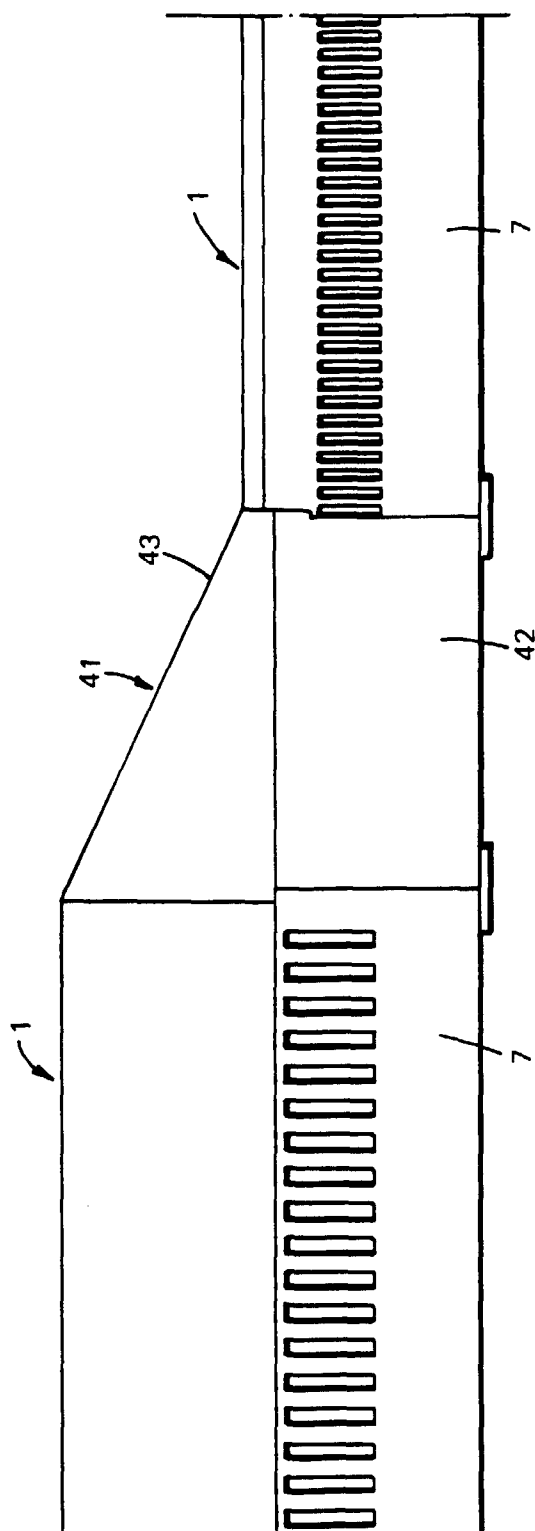


FIG. 25