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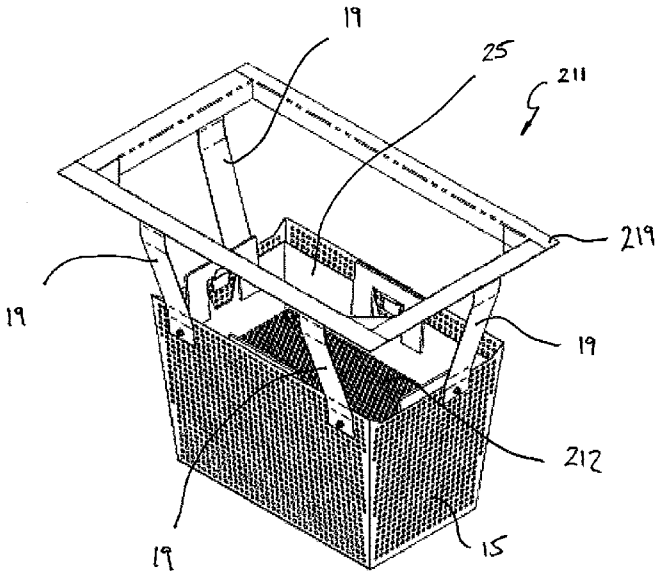

Fig 14

(57) Abstract: The present invention provides a drainage treatment system (11) for minimising debris entering a drainage system. The drainage treatment system comprises a support housing (13) which is supportingly received in the drainage system downstream of an opening of the drainage system. The support housing comprises a first drainage means (21) for allowing liquid to flow therethrough. The drainage treatment system also comprises a first insert (25) for collecting debris. The first insert comprising a second drainage means (27) for allowing liquid to flow therethrough whilst preventing the flow through of debris. The first insert is removably supported within the housing such that when in place the first drainage means and second drainage means align, allowing liquid to pass through the drainage treatment system. In use, debris collects in the drainage treatment system and is removed therefrom by removing the first insert from the support housing.

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Drainage treatment system

Field of the Invention

The present invention generally relates to a drainage treatment system for use in drainage systems. In particular the invention provides a system which collects debris entering a drain for easy removal therefrom.

Background Art

A common problem associated with drainage systems is the tendency for debris to collect in the drainage system. Eventually the drainage system becomes blocked due to the debris which has accumulated in the system. Once the drain becomes blocked the area around the drain floods. This can be extremely hazardous, particularly where traffic is involved.

Debris passing though drainage systems can also be problematic in water treatment facilities, and may also leak from the drainage system and prove hazardous to the environment. It is therefore advantageous to minimise the debris which is able to accumulate and eventually block the drainage system.

Several systems have been devised to filter debris from the liquid as it passes through the drain grate or drain opening. At some point the debris which has been collected needs to be removed from the system. In the prior art, this usually entails the use of a vacuum to suck the collected debris from the system. These systems incorporate filter plates/screens which slide into a housing. These plates/screens also require cleaning. In order to do this the plates/screens must first be removed from the drain and a high pressure hose used to clean the filter. These systems are complicated in their construction and do not allow for the easy removal of debris collected therein. Furthermore the plates/screens also restrict the flow of liquid able to pass through the drain. While this may be inconsequential when the flow rate through the drain is small, it does pose a significant problem as the flow rate increases.

Other prior art solutions incorporate a diverter which channels the liquid as, or after it enters the drain through a debris collection system. The diverter suffers the same disadvantages associated with plates/screens. As the diverter narrows the size of the drain opening, it acts to restrict the flow through the drain. Again, while this may be inconsequential when the flow rate through the drain is small, it does pose a significant problem as the flow rate increases. As the flow rate increases, the drain is not able to operate at the capacity it was designed to operate due to the size of the drain opening being reduced by the diverter. The drain is therefore unable to operate at its intended capacity. This will lead to flooding around the drain.

The preceding discussion of the background to the invention is intended only to facilitate an understanding of the present invention. It should be appreciated that the discussion is not an acknowledgment or admission that any of the material referred to was part of the common general knowledge as at the priority date of the application.

Summary of the Invention

It is an object of this invention to provide a drainage treatment system for drainage systems which removes at least part of the debris from the liquid flowing into a drainage system in a manner which will allow easy removal of the debris from the drainage treatment system.

Typical drainage systems comprise an opening which allows liquid/debris to enter the drainage system. The opening generally opens into a pit before passing into a pipe. The pit takes many forms including a pipe or a brick pit. Once the liquid/debris enters the drainage system through the opening, a network of pipes channels the liquid/debris to a reservoir, treatment plant, sensitive water body, river or ocean. The opening may be a side opening typically incorporated in a kerb, a road opening typically covered by a grate, or a combination of both. The present invention is applicable to at least each of these three variants

Throughout the specification the term 'debris' is taken to mean any item entrained in a liquid. Typically this would include leaves, branches, rubbish and sand but in some applications can also include chemical pollutants.

The present invention provides a drainage treatment system for minimising debris entering a drainage system, the drainage treatment system comprises:

a support housing adapted to be supportingly received in the drainage system downstream of an opening of the drainage system, the support housing comprising a first drainage means for allowing liquid to flow therethrough;

a first insert for collecting debris, the first insert comprising a second drainage means for allowing liquid to flow therethrough whilst preventing the flow through of debris, the first insert being removably supported within the housing such that when in place the first drainage means and second drainage means allow liquid to pass through the drainage treatment system;

wherein the debris collected in the drainage treatment system is removed therefrom by removing the first insert from the support housing.

In contrast to the prior art, the drainage treatment system of the current invention enables collection of the debris from the liquid passing into the drainage system but also allows the debris to be removed from the drainage treatment system without the need of a vacuum or other machinery. In the case of the present invention, the drainage treatment system can quickly be cleaned by removing the first insert and then placing a new one in its place. Alternatively, the debris in the first insert can be discharged into a bin and then the first insert may be placed back into the support housing. Furthermore the present invention does not alter the size of the drain opening, allowing the drain to operate at full capacity when in place.

Preferably the drainage treatment system comprises a diffuser. The diffuser may be located in the first insert to minimise debris collected by the first insert from re-entering the drainage system as a result of the impact of the liquid thereupon as the liquid enters the drain opening. The diffuser may comprise openings therein to allow the liquid and debris to pass therethrough and into the first insert. In use the diffuser may be received in the first insert such that the top of the diffuser is located below the opening of the first insert. As the first insert fills with debris the impact of the liquid falling through the drain opening has the tendency to cause the debris to be ejected from the first insert, allowing the debris to accumulate in the drainage system downstream from the drainage drainage treatment system. Obviously as the level of the debris collected by the first insert increases a greater amount of debris is ejected. The diffuser absorbs the impact of the liquid falling though the drains opening allowing the first insert to collect a greater amount of debris.

The support housing may comprise a first housing for receiving the first insert, and a securing means to removably support the drainage treatment system relative to the drainage system. Preferably the securing means does not interfere with or cross-over the flow of liquid through the drain opening.

The first housing may be tapered inwardly such that an opening of the first housing is larger than the bottom thereof.

In one aspect of the invention the opening of the first housing is larger than the size of the drain opening. Preferably the opening of the first housing is longer and wider than the length and width of the drain opening. With side entry pits, (i.e. where the drain opening is incorporated in the kerb), the pit has an inspection cover, adjacent the drain opening, through which the drainage treatment system may be installed.

In another aspect of the invention the opening of the first housing is smaller than the size of the drain opening. This is applicable for pits having a grate over the opening, such as those incorporated in a road surface. In these instances the

first insert will need to be slightly smaller than the opening in order to allow for installation and removal of the drainage treatment system.

The first housing may support one or more fixings to which the first insert may be fixed. The fixings may be in the form of brackets located on the inner surface of the first housing.

Preferably the entire first housing provides the first drainage means.

In one aspect of the invention the first drainage means is in the form of a mesh material. The first housing may be formed from the mesh material.

In another aspect of the invention the first drainage means is formed of perforated sheet metal. The first housing may be formed from the perforated sheet metal. Alternatively the first housing may be formed from plastic and may be formed by injected moulding.

The support housing may be removably received within the drainage system such that the first housing is located in a pipe / pit downstream from the opening. This will require the removal of the drain grate or inspection cover in order to position and remove the support housing.

Preferably the opening of the first housing is smaller than the size of the pit into which it is received. This will allow liquid flowing into the drain to bypass the first housing in the event that the first insert is full of debris. This ensures that the drain continues to operate at full capacity if the first insert is full of debris and does not affect the Hydraulic Gradient line of the drainage network.In one aspect of the invention the securing means comprises two or more arms extending upwardly from the first housing. The distal end of each arm may have an outwardly extending projection adapted to engage a surface of the drainage system. The surface may be the surface upon which the grate is supported when the grate is in place over the drain opening. Preferably the distal end of each of the two or more arms is locatable on the surface of the drainage system which

does not experience the greatest flow rate thereover. This will ensure the drain opening is able to operate at full capacity.

In another aspect of the invention the securing means is provided by the top portion of the first housing. The top portion may extend outwardly such that it is adapted to engage the surface upon which the grate is supported when the grate is in place.

The support housing may also comprise a second housing. The second housing may be located below the first housing such that in use it is downstream therefrom. The second housing may have a third drainage means. Preferably the entire second housing provides the third drainage means.

In one aspect of the invention the third drainage means is in the form of a mesh material. The second housing may be formed from the mesh material.

In another aspect of the invention the third drainage means is in the form of perforated sheet metal. The second housing may be formed from the perforated sheet metal.

Preferably the entire first insert provides the second drainage means. The first insert may be formed from a porous woven material, the material being selected according to the minimum sized particle which is to be separated from the liquid. The material may be such that liquid passes through the first insert even when the first insert is full of debris. The woven material may provide a capillary action which allows liquid to pass therethrough.

The first insert may be formed by gluing the material together to form the first insert. The glue, once dry, may act as stiffening members to add rigidity the first insert. However, the glue remains sufficiently flexible to allow the first insert to flex without the material tearing in those regions bonded by the glue.

The first insert may be formed such that the first insert substantially retains its shape whether it is full or empty. Generally this ensures the material remains flat

against the first housing to ensure consistent filtering of liquid. It also assists with capillary action assisting the normal flow through the first insert.

The first insert may be snugly received within the first housing. The first insert may be tapered. By having the first housing and first insert tapered, the first insert may easily be removed from, and inserted into the first housing.

The first insert may be slightly shorter than the first housing. This will allow liquid flowing into the drain to bypass the first insert in the event that the first insert is full of debris.

The first insert may have one or more handles to allow easy removal of the first insert from the first housing. Each handle may be located on the bracket of the first housing. This will ensure the walls of the first insert remain adjacent to the wall of the first housing, preventing the first insert from collapsing and therefore not effectively collecting debris as it passes into the drainage system.

The drainage treatment system may also comprise a second insert which may be received in the second housing. When in place the second insert may be located below the first housing. The second insert may be in the form of a filter for filtering chemicals, oils and/or other similar contaminants from the fluid passing into the drainage system.

The first housing may have a projection extending outwardly from an edge thereof at an angle of substantially 90° thereto. This projection may extend along the length of the edge. In those situations in which the grate is hingedly connected to the opening, the projection will be able to be positioned along the edge of the drain opening to which the grate is connected. This will ensure debris flows into the opening as opposed to accumulating around the hinge connection.

The present invention provides a drainage treatment system for minimising debris accumulating in a drainage system, the drainage treatment system comprises:

a support housing which is supportingly received in the drainage system, the support housing comprising a first drainage means for allowing liquid to flow therethrough;

a first insert, removably supported within the support housing, for collecting debris, the first insert comprising a second drainage means for allowing liquid to flow therethrough whilst preventing the flow through of debris; and

a diffuser located in the first insert to minimise debris collected in the first insert from being ejected therefrom.

The drainage treatment system according to the invention may further comprise at least one flow diverter for directing flow into the entry of the support housing. The flow diverter may be operable to direct incoming flow within the drainage system into the first insert. In this way there is directional control of incoming flow into the first housing.

The flow diverter may comprises a feeder plate having an upper end adapted to disposed adjacent the entry of a drainage system and a lower end adapted to extend into the first insert, or at least disposed above the open top of the first insert. With this arrangement, the feeder plate extends between the entry of the drainage system and the drainage treatment system, and presents a flow control surface along which incoming flow within the drainage system can be guided into the first insert.

Brief Description of the Drawings

The invention will be better understood by reference to the following description of several specific embodiments thereof as shown in the accompanying drawings in which:

Figure 1 is a perspective view of the drainage treatment system according to a first embodiment

Figure 2 is a perspective view of a support housing of the drainage treatment system shown in figure 1;

Figure 3 is a side view of the support housing shown in figure 2;

Figure 4 is a front view of the support housing shown in figure 2;

Figure 5 is a plan view of the support housing shown in figure 2;

Figure 6 is a perspective view of a first insert according to the first embodiment;

Figure 7 is a perspective view of a drainage treatment system of figure 1 located in a drainage system;

Figure 8 shows the support housing located in a drainage system with the first insert full of debris and removed from the first housing;

Figure 9 is a perspective view of the drainage treatment system according to a second embodiment;

Figure 10 is a perspective view of a support housing of a drainage treatment system similar to that shown in figure 9 but having only two elongate arms;

Figure 11 is a side view of the support housing shown in figure 10;

Figure 12 is a front view of the support housing shown in figure 10; and

Figure 13 is a plan view of the support housing shown in figure 10.

Figure 14 is a perspective view of the drainage treatment system according to a third embodiment;

Figure 15 is a rear view of the drainage treatment system shown in figure 14;

Figure 16 is a cross sectional side view of the drainage treatment system shown in figure 14;

Figure 17 is a perspective view of a diffuser;

Figure 18 is a perspective view of a first housing and support arms of a drainage treatment system according to a fourth embodiment; Figure 19 is a perspective view of a first housing of a drainage treatment system according to a fifth embodiment;

Figure 20 is a perspective view of the drainage treatment system according to a sixth embodiment; and

Figure 21 is a fragmentary perspective view of the arrangement shown in Figure 20.

In the drawings like structures are referred to by like numerals throughout the several views. The drawings shown are not necessarily to scale, with emphasis instead generally being placed upon illustrating the principles of the present invention.

Best Mode(s) for Carrying out the Invention

The drainage treatment system of the present invention is generally designed to be located within the inlet of a drainage system adjacent, but downstream of the opening into the drainage system (e.g. downstream of the grate). However, it is to be understood that the drainage treatment system may be located anywhere within the drainage system. The drainage system typically comprises a network of pipes which have openings through which liquid and debris pass to enter the drainage system.

Referring to figures 1 to 8, the invention according to a first embodiment is in the form of a drainage treatment system 11 for removing debris from a liquid as it passes into a drainage system.

The drainage treatment system 11 of this embodiment is formed to remove both hard debris (e.g. sand, leaves, rubbish) from the liquid flowing into the drainage system, as well as chemical contaminants. Other embodiments as covered by the scope of this specification also include those drainage treatment systems which may be used to remove only one of these forms of debris.

The drainage treatment system 11 comprises a support housing 13. As best show in figures 2 to 5 the support housing 13 comprises a first housing 15, a second housing 17 and securing means in the form of four elongate arms 19.

The first housing 15 is formed from perforated sheet metal and provides a first drainage means 21. The first housing 15 is in the shape of a basket having tapered sides. The angle of the taper is such that as much of the liquid leaving the first housing 15 flows into the second housing 17.

Inner surfaces of the first housing 15 support fixings in the form of brackets 23 for reasons described below.

The first housing 15 is adapted to receive a first insert 25. The first insert 25 is formed from a woven, porous material to provide a second drainage means 27. The woven, porous material allows liquid to readily pass therethrough whilst blocking debris and therefore removing the debris from the liquid. The first insert 25 is snugly received in the first housing 15. This allows the debris to collect in the first insert whilst the liquid can pass into the drainage system minus the debris. The debris therefore accumulates in the first insert 25 rather than accumulating in the drainage system. The first insert 25 is also of a similar tapered, basket shape to the first housing enabling the first insert 25 to be easily removed from the first housing 15.

The first insert 25 also incorporates a set of handles 29 to assist in removing the first insert 25 from the first housing 15. As best shown in figure 7, the handles 29 are adapted to be positioned over the brackets 23, ensuring the first insert 25 does not collapse as debris collects therein.

The second housing 17 is located in spaced relation from the first housing 15 such that in use it is located downstream from the first housing 15. The bottom of the second housing 17 is also formed from perforated sheet metal and provides a third drainage means 31. The second housing 17 is adapted to receive a second insert 33 which is designed to remove contaminants such as oils and other chemicals from the liquid flowing therethrough. The sides of the second housing 17 are solid to ensure as much liquid as possible passes through the second insert 33. In other embodiments the second insert 33 may be located in the first housing 15, negating the need for the second housing 17.

The arms 19 removably support the drainage treatment system 11 in position. The arms 19 are attached to the side of the first and second housings. At a distal end 35, each arm has an outwardly extending projection 37. When the drainage treatment system 11 is in the drainage system, each projection 37 is adapted to be located on a surface upon which the drainage systems grate 41

rests, as best shown in figure 7. With this arrangement the drainage treatment system 11 is suspended from the drain opening. As it utilises existing structures the drainage treatment system 11 can be readily fitted to an opening without first requiring modification. The arms 19 are made from a sufficiently thin sheet material to allow a degree of flexing as the drainage treatment system 11 is installed or removed..

In use, liquid flowing through the grate 41 passes into and through the first insert 25, leaving behind hard debris such as leaves and sand, etc. The size of the debris removed from the liquid is governed by the material chosen to form the first insert 25. After the liquid passes through the first insert 25 and first housing 15, it flows through the second insert 33, which filters contaminants from the liquid, before passing through the second housing 17 and into the drainage system, relatively free of debris. At regular intervals, or after major downpours, the drainage treatment system 11 may be checked by an operator and the first insert 25 removed from the first housing 15 to empty the debris from the first insert 25. The first insert 25 may be emptied on the spot into a bin, or a replacement insert may be placed in the first housing and the full insert may be cleaned at a later time. Alternatively the entire drainage treatment system 11 may be removed to allow for easy removal of the first insert from the first housing for cleaning or replacement. This is particularly useful when the operator has a lifting mechanism to hand to assist in removing the drainage treatment system 11.

The second insert 33 will not need replacing for several years. When it is time to replace the second insert 33 the drainage treatment system 11 is removed from the drainage system and overall maintenance can be carried out before the system is placed back into position.

A second embodiment of the invention is illustrated in figures 9 to 13. This embodiment is identical to that of the first embodiment with the exception of its shape. The drainage treatment system 111 of this embodiment is particularly adapted to those drainage systems having a round opening.

A third embodiment of the invention is illustrated in figures 14 to 17. This embodiment is similar to that of the first embodiment. For convenience features of the third embodiment that are similar or correspond to features of the first embodiment have been referenced with the same reference numerals. Amongst other differences, the drainage treatment system of the third and fourth embodiments does not have a second housing or second insert. The second housing is particularly useful when a further filtering stage is required and can be readily added to the drainage treatment system of the third and fourth embodiments as may be required.

The drainage treatment system 211 of this embodiment is particularly adapted to suit those drainage systems having a side entry opening, such as those in which the opening to the drainage system is incorporated in the roadside kerb. As may be best noted in figure 14 and 16, the side of the drainage treatment system which will be adjacent to the opening is free from any obstacle which would otherwise block the flow of liquid/debris. This is achieved by positioning the arms 19 such that they do not cross between the opening of the drain and the first insert 25.

The drainage treatment system 211 comprises a frame 219 to which the distal ends 35 of each arm 19 are secured. The frame 219 is adapted to be located on a surface upon which a drain cover (not shown) rests. When the treat system 211 is in position the frame 219 is located above the side opening and therefore does not interfere with the flow of liquid/debris into the drainage system. The frame 219 also improves the robustness of the drainage treatment system 211 and allows the drainage treatment system to be more easily positioned and removed when required.

The drainage treatment system 211 also comprises a diffuser 212. As best shown in figure 16, the diffuser is positioned in the first insert 25, such that an upper plate 213 of the diffuser 212 is located below the first inserts 25 opening. The diffuser 212 is positioned such that as the liquid/debris enters through the side opening of the drainage system the liquid impacts upon the diffuser 212.

When the diffuser 212 is present the force of the liquid is absorbed by the diffuser 212. This ensures that any debris collected in the first insert 25 is not expelled from the first insert 25 as liquid/debris enters the first insert 25 from the drain opening. This is of particular importance as the level of debris collected in the first insert 25 increases.

As best shown in figure 17, the upper plate 213 of the diffuser 212 incorporates a plurality of holes. These holes allow liquid to pass into the first insert 25. The effect of the diffuser 212 is that the liquid 'sucks' the debris under it and helps keep the debris in the first insert 25.

A fourth embodiment of the invention is illustrated in figure 18. This embodiment is similar to that of the first embodiment. For convenience features of the fourth embodiment that are similar or correspond to features of the first embodiment have been referenced with the same reference numerals.

The drainage treatment system 311 of this embodiment is particularly adapted to those drainage systems having an opening covered by a grate, whereby the opening is located in a substantially horizontal surface, such as may be the case with road surface drains. In this embodiment the first housing comprises two elongate arms 319 extending upwardly from opposed sides of the first housing. The arms 319 extend along the length of the side of the housing. This construction improves the robustness of the drainage treatment system 311 and allows the drainage treatment system to be more easily positioned and removed when required.

Amongst other differences, the drainage treatment system of the third and fourth embodiments does not have a second housing or second insert. The second housing is particularly useful when a further filtering stage is required and can be readily added to the drainage treatment system of the third and fourth embodiments as may be required.

As there is no single standard drain pit and opening the drainage treatment system of the present invention can be customised and adapted to suit most

drainage systems. By way of further example, figure 19 shows a further embodiment of a drainage treatment system 411 wherein the first housing 425 has a semi-circular shape.

A sixth embodiment of the invention is illustrated in figures 20 and 21. This embodiment is similar to that of the first embodiment. For convenience features of the sixth embodiment that are similar or correspond to features of the first embodiment have been referenced with the same reference numerals.

The sixth embodiment has been devised for circumstances where the entry 15a of the first housing 15 of the drainage treatment system 11 is set below the entry of the drainage system into which it is to be installed. In such circumstances, there is a possibility that at least a portion of the incoming flow into the drainage system might bypass the first housing 15 and flow around the drainage treatment system 11.

In this sixth embodiment, the drainage treatment system 11 incorporates at least one flow diverter 350 for directing flow within the drainage system into the entry 15a of the first housing 15 of the drainage treatment system. The flow diverter 350 is operable to direct incoming flow within the drainage system into the entry 15a of the first housing 15. In this way there is directional control of incoming flow into the first housing 15. In the arrangement shown, there are two flow diverters 3500, one adjacent each end of the drainage treatment system 11 according to the embodiment. However, it should be understood that the flow diverter(s) 350 can be located at any appropriate position within the drainage treatment system 11.

In the arrangement shown in Figures 20 and 21, the drainage system is identified by reference numeral 351 and the entry of the drainage system is identified by reference numeral 352. Each flow diverter 350 comprises a feeder plate 355 having an upper end 357 disposed adjacent the entry 352 and a lower end 359 extending into the first insert 25, or at least disposed above the open top 25a of the first insert 25. With this arrangement, the feeder plate 355 extends generally between the entry 352 of the drainage system 351 and the drainage treatment

system 11, and presents a flow control surface 361 along which incoming flow entering the drainage system 351 through entry 352 can be guided into the first insert 25.In this embodiment, each feeder plate 355 comprises a sheet 363 of pliant material which is rigid yet sufficiently flexible to permit deformation into a desired profile. By way of example, the sheet 363 may comprise flashing material of a type known to a person skilled in the art. The sheet material may be retained in place in any appropriate manner, such as by ties 365 as depicted in Figures 20 and 21.

While flow diverter 350 has been described as a feature of this sixth embodiment, it can of course be applied, as appropriate, to any embodiment of the present invention, including but not limited to various embodiments described and illustrated in Figures 1 to 19.

The advantages of the present invention include:

- easily installed and removed, whilst having no visual impact;
- easy to remove collected debris;
- degree of filtering can be varied by using different materials for the inserts;
- can provide clean water supply for use in other areas and can enable water harvesting;
- insert cannot at any time be pushed up by the water level and form a blockage in the pit or pipe due to the size of the insert being greater that the size of the overflow;
- at all times there is more overflow area at the top of the basket than the size of the interconnecting pipe and hence will not affect the Hydraulic Gradient Line.

Modifications and variations such as would be apparent to the skilled addressee

are considered to fall within the scope of the present invention. For example, the first insert may be formed from two or more layers whereby one layer may remove hard debris whilst the other layer removes chemical contaminants.

Reference to positional descriptions, such as lower and upper, are to be taken in context of the embodiments depicted in the figures, and are not to be taken as limiting the invention to the literal interpretation of the term but rather as would be understood by the skilled addressee.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

Claims

1. A drainage treatment system for minimising debris entering a drainage system, the drainage treatment system comprises:

   a support housing adapted to be supportingly received in the drainage system downstream of an opening of the drainage system, the support housing comprising a first drainage means for allowing liquid to flow therethrough;

   an first insert for collecting debris, the first insert comprising a second drainage means for allowing liquid to flow therethrough whilst preventing the flow through of debris, the first insert being removably supported within the housing such that when in place the first drainage means and second drainage means allow liquid to pass through the drainage treatment system;

   wherein the debris collected in the drainage treatment system is removed therefrom by removing the first insert from the support housing.

2. The drainage treatment system according to claim 1 wherein the drainage treatment system comprises a diffuser, the diffuser being locatable in the first insert.

3. The drainage treatment system according to claim 2 wherein the diffuser comprises openings therein to allow the liquid and debris to pass therethrough.

4. The drainage treatment system according to claim 1, 2 or 3 wherein the support housing comprises a first housing for receiving the first insert.

5. The drainage treatment system according to claim 4 wherein the first housing is tapered inwardly such that an opening of the first housing is larger than the bottom thereof.

6. The drainage treatment system according to claim 4 or 5 wherein the opening of the first housing is larger than the size of the drain opening.

7. The drainage treatment system according to claim 4 or 5 wherein the opening of the first housing is smaller than the size of the drain opening.

8. The drainage treatment system according to any one of claims 4 to 7 wherein the first housing supports one or more fixings to which the first insert is fixed, the fixings being in the form of brackets located on the inner surface of the first housing.

9. The drainage treatment system according to any one of claims 4 to 8 wherein the entire first housing provides the first drainage means.

10. The drainage treatment system according to any one of the preceding claims wherein the first drainage means is formed from a mesh material, perforated sheet metal or plastic.

11. The drainage treatment system according to any one of claims 4 to 10 wherein the opening of the first housing is smaller than the size of the pit it is received.

12. The drainage treatment system according to any one of the preceding claims further comprising a securing means to removably support the drainage treatment system relative to the drainage system.

13. The drainage treatment system according to claim 12 wherein the securing means does not interfere or cross-over the flow of liquid through the drain opening.

14. The drainage treatment system according to claim 12 or 13 wherein the securing means comprises two or more arms extending upwardly from the first housing.

15. The drainage treatment system according to claim 14 wherein a distal end of each arm has an outwardly extending projection adapted to engage a surface of the drainage system.

16. The drainage treatment system according to claim 15 wherein the distal end of each of the two or more arms is locatable on that surface of the drainage system which does not experience the greatest flow rate thereover.

17. The drainage treatment system according to claim 15 or 16 wherein the surface is the surface upon which the grate is supported when the grate is in place over the drain opening.

18. The drainage treatment system according to claim 12 or 13 wherein the securing means is provided by the top portion of the first housing, the top portion extending outwardly such that it is adapted to engage a surface upon which the grate is supported when the grate is in place.

19. The drainage treatment system according to any one of the preceding claims wherein the support housing further comprises a second housing.

20. The drainage treatment system according to claim 19 when dependent on claim 4 wherein the second housing is located below the first housing such that in use it is downstream therefrom.

21. The drainage treatment system according to claim 19 or 20 wherein the second housing has a third drainage means.

22. The drainage treatment system according to claim 21 wherein the entire second housing provides the third drainage means.

23. The drainage treatment system according to claims 21 or 22 wherein the third drainage means is formed from a mesh material or perforated sheet metal or plastic.

24. The drainage treatment system according to any one of the preceding claims wherein the entire first insert provides the second drainage means.

25. The drainage treatment system according to any one of the preceding claims wherein the first insert is formed from a porous woven material, the material being selected according to the minimum sized particle which is to be separated from the liquid.

26. The drainage treatment system according to any one of the preceding claims wherein the first insert is formed such that the first insert substantially retains its shape whether it is full or empty

27. The drainage treatment system according to any one of claims 4 to 26 wherein the first insert is snugly received within the first housing, the first insert being tapered.

28. The drainage treatment system according to any one of claims 4 to 27 wherein the first insert is shorter than the first housing.

29. The drainage treatment system according to any one of claims 4 to 28 wherein the first insert has one or more handles to allow easy removal of the first insert from the first housing.

30. The drainage treatment system according to claim 29 wherein each handle is adapted to be located on the bracket of the first housing.

31. The drainage treatment system according to any one of claims 19 to 30 further comprising a second insert which is received in the second housing.

32. The drainage treatment system according to claim 31 wherein the second insert is in the form of a filter for filtering chemicals, oils and/or other similar contaminants from the fluid passing into the drainage system.

33. A drainage treatment system for minimising debris accumulating in a drainage system, the drainage treatment system comprises:

a support housing which is supportingly received in the drainage system, the support housing comprising a first drainage means for allowing liquid to flow therethrough;

a first insert, removably supported within the support housing, for collecting debris, the first insert comprising a second drainage means for allowing liquid to flow therethrough whilst preventing the flow through of debris; and

a diffuser located in the first insert to minimise debris collected in the first insert from being ejected therefrom.

34. A drainage treatment system according to any one of the preceding claims further comprising at least one flow diverter for directing flow into the first insert.

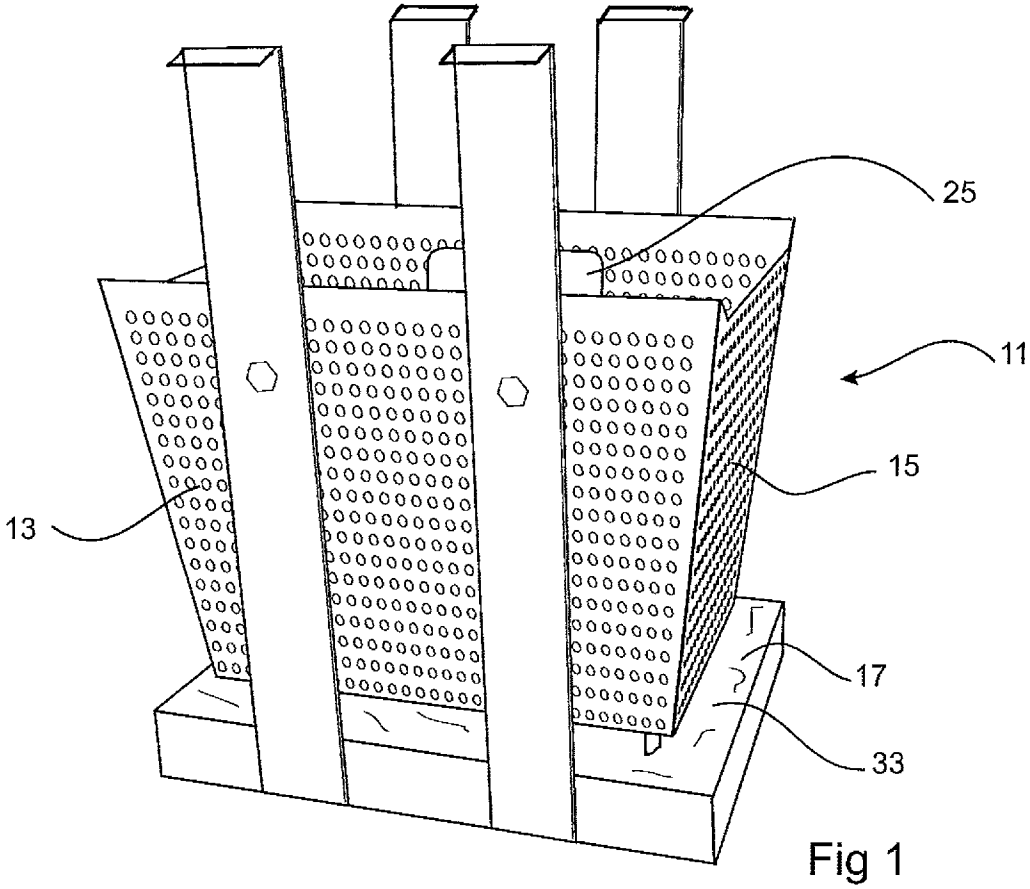


Fig 1

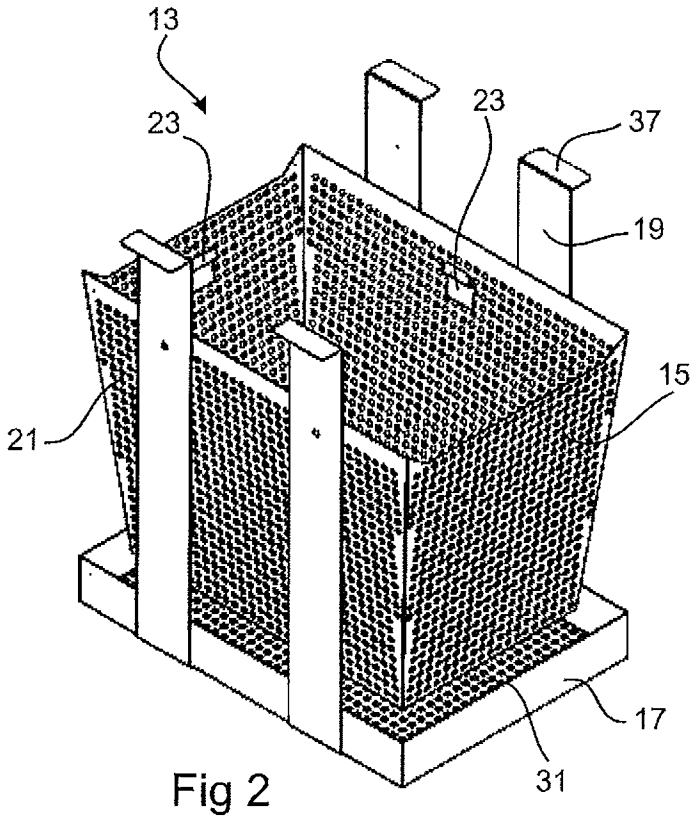


Fig 2

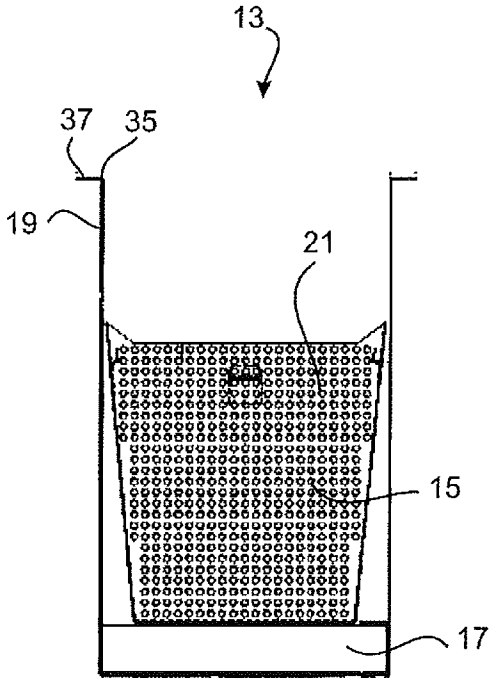


Fig 3

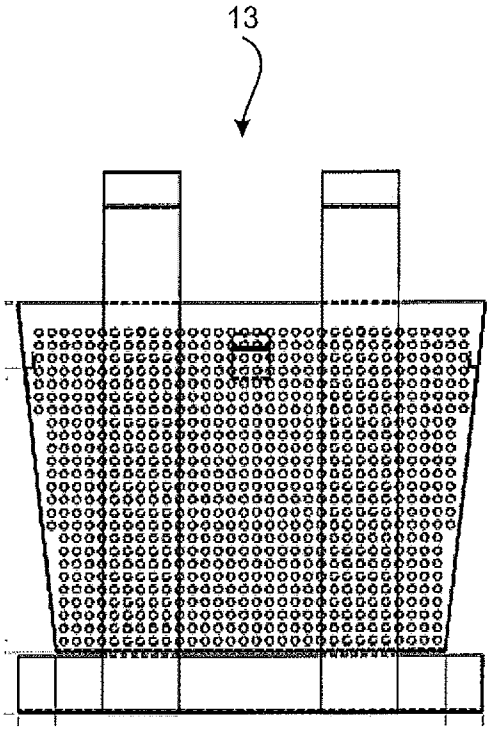


Fig 4

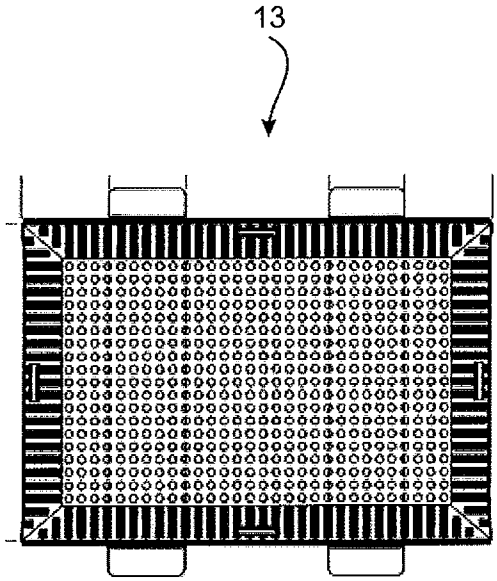


Fig 5

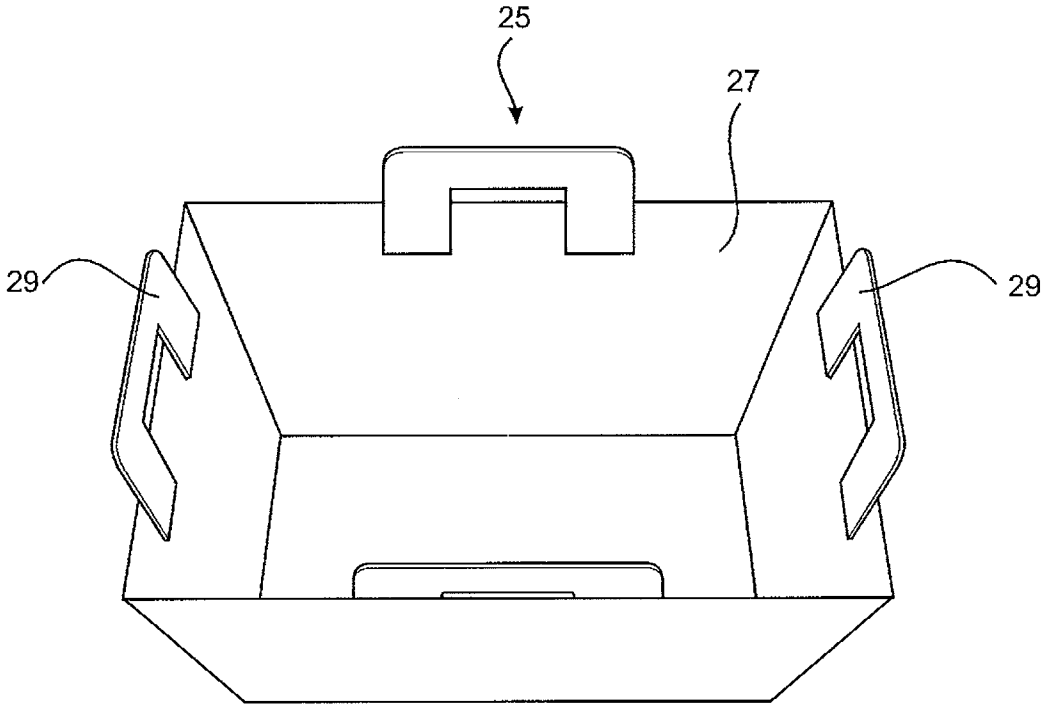
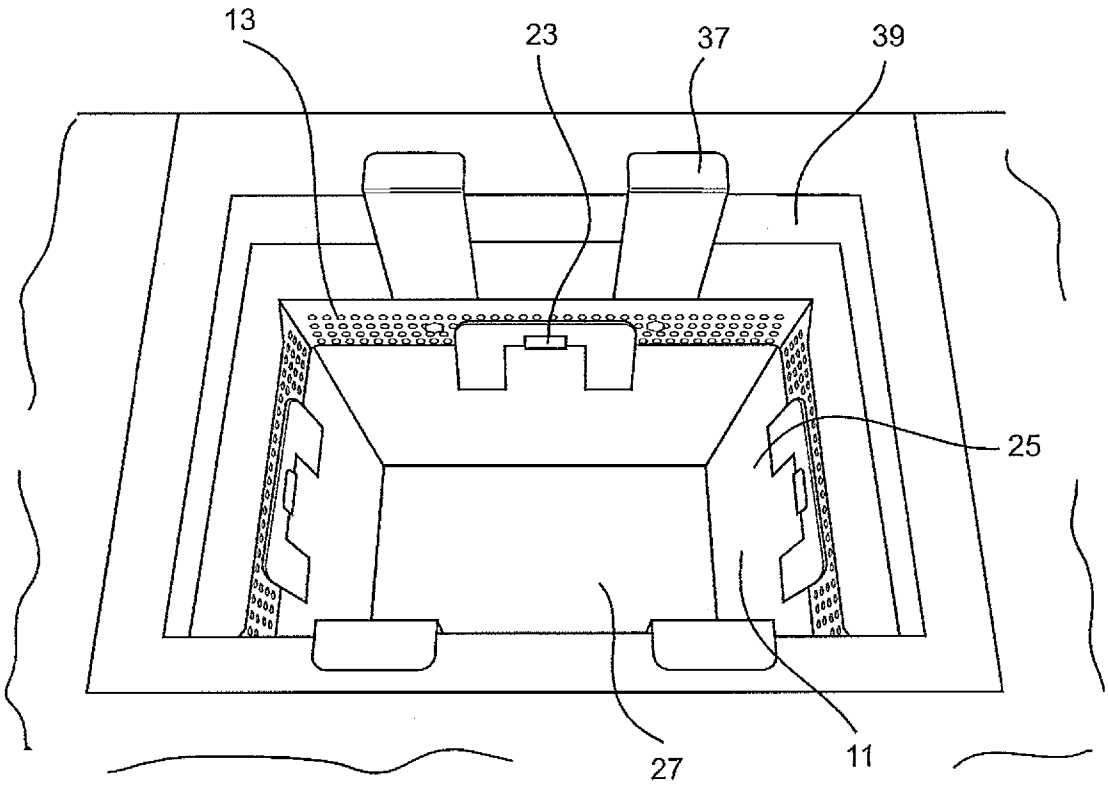


Fig 6



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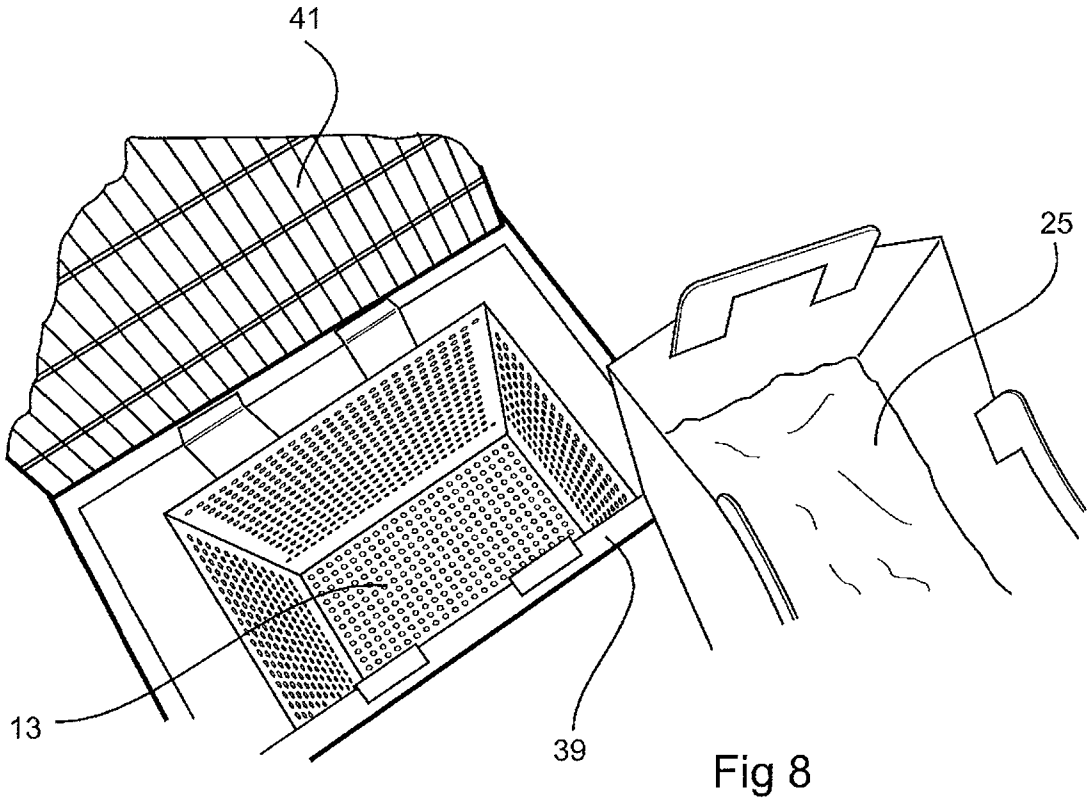

Fig 8

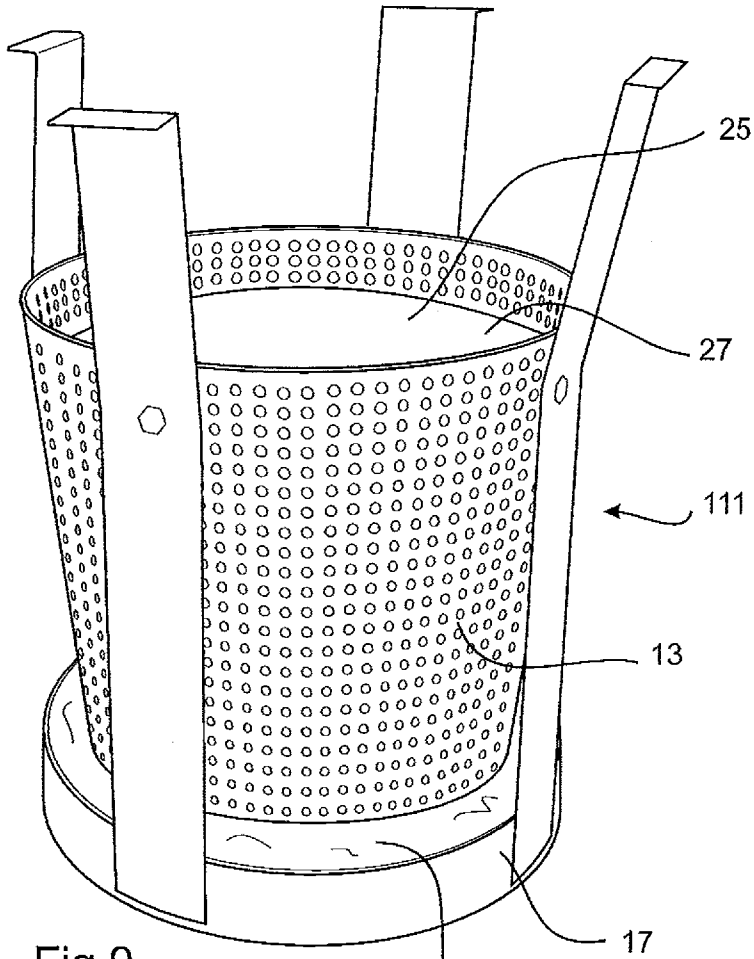

Fig 9

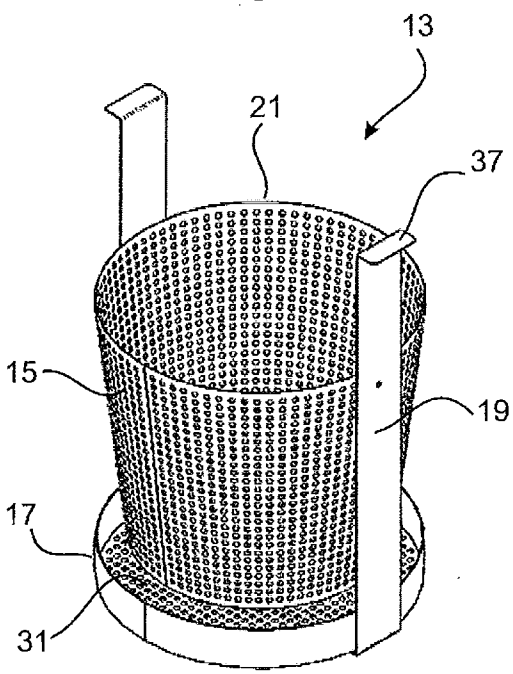

Fig 10

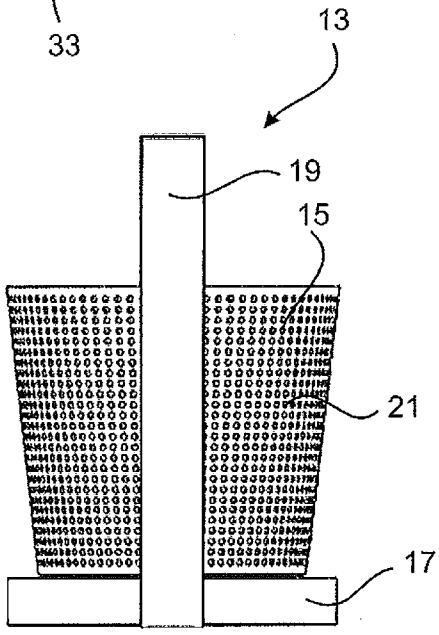

Fig 11

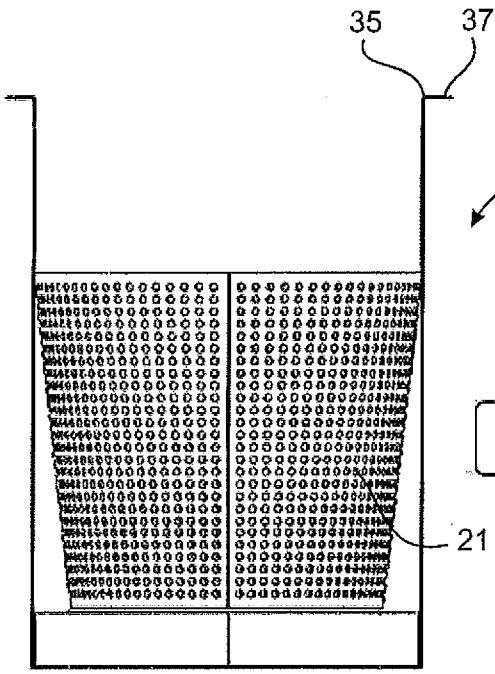

Fig 12

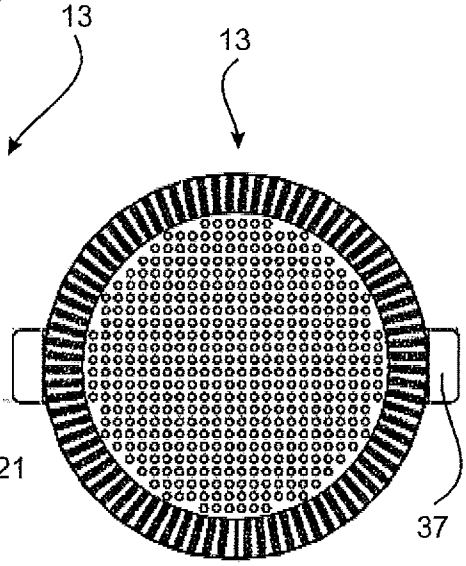

Fig 13

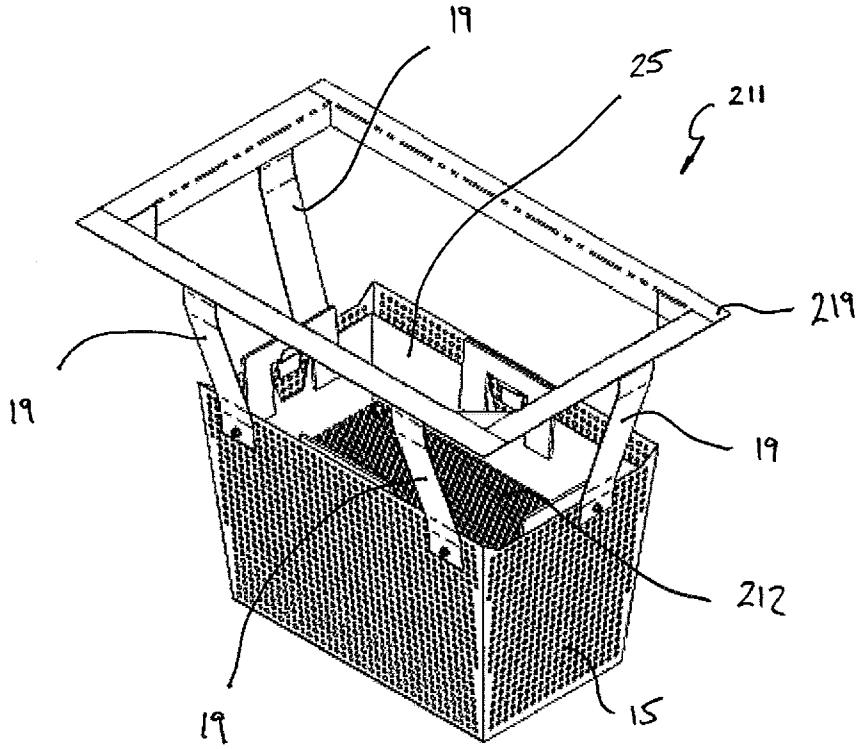

Fig 14

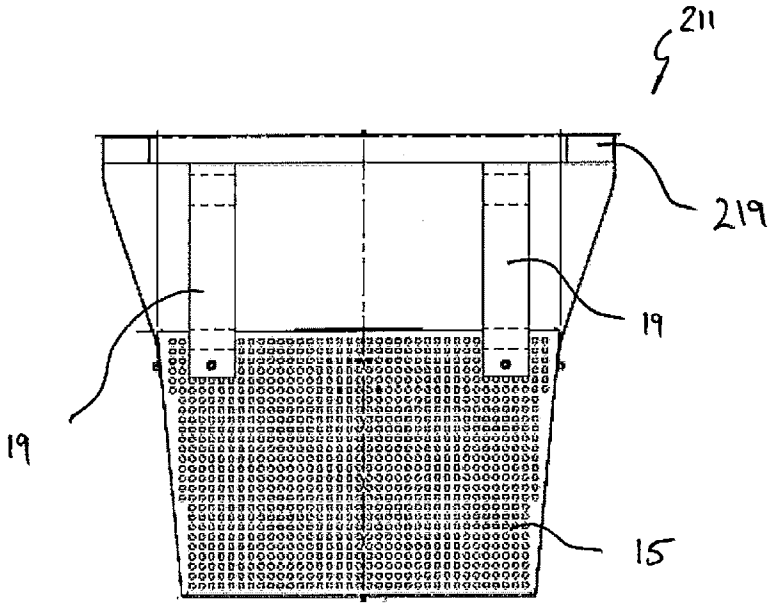

Fig 15

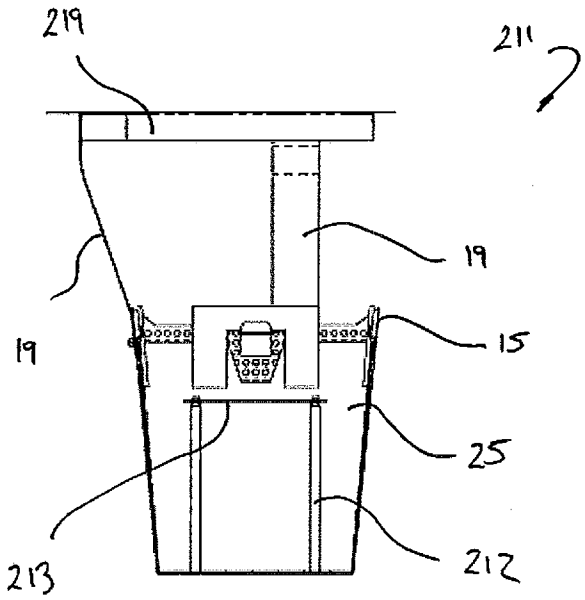

Fig 16

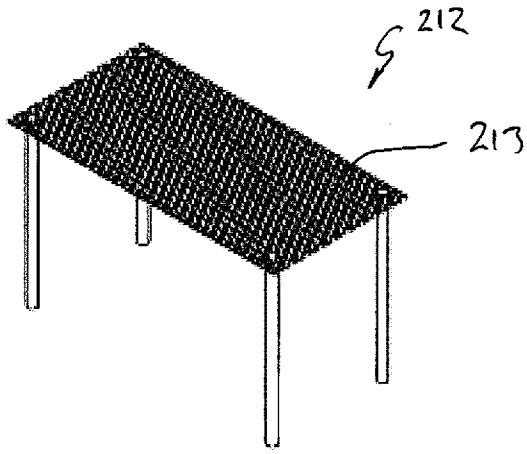

Fig 17

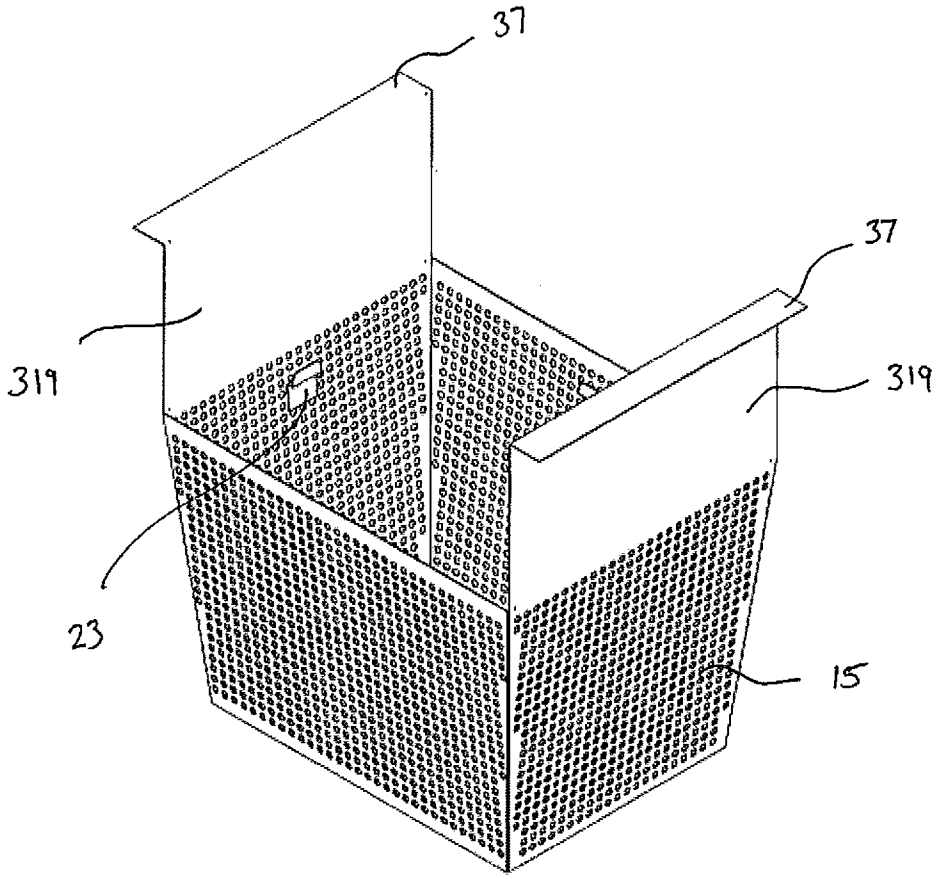

Fig 18

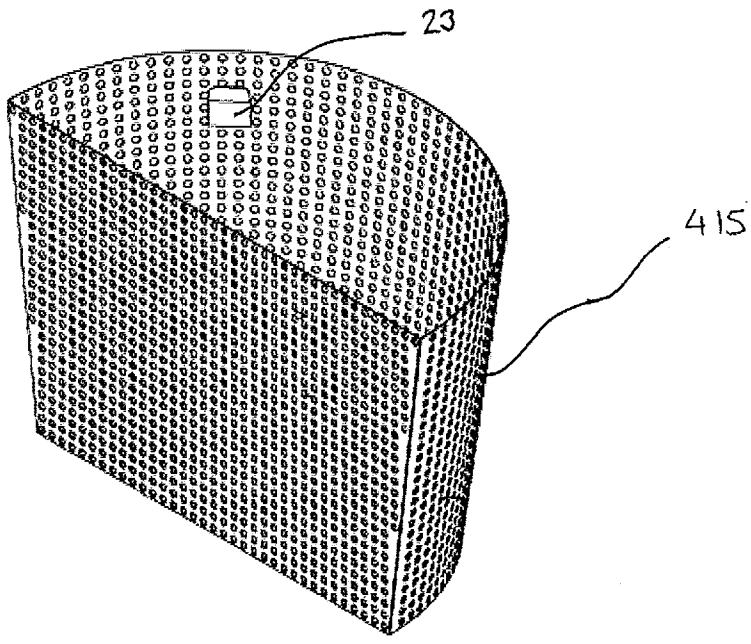

Fig 19

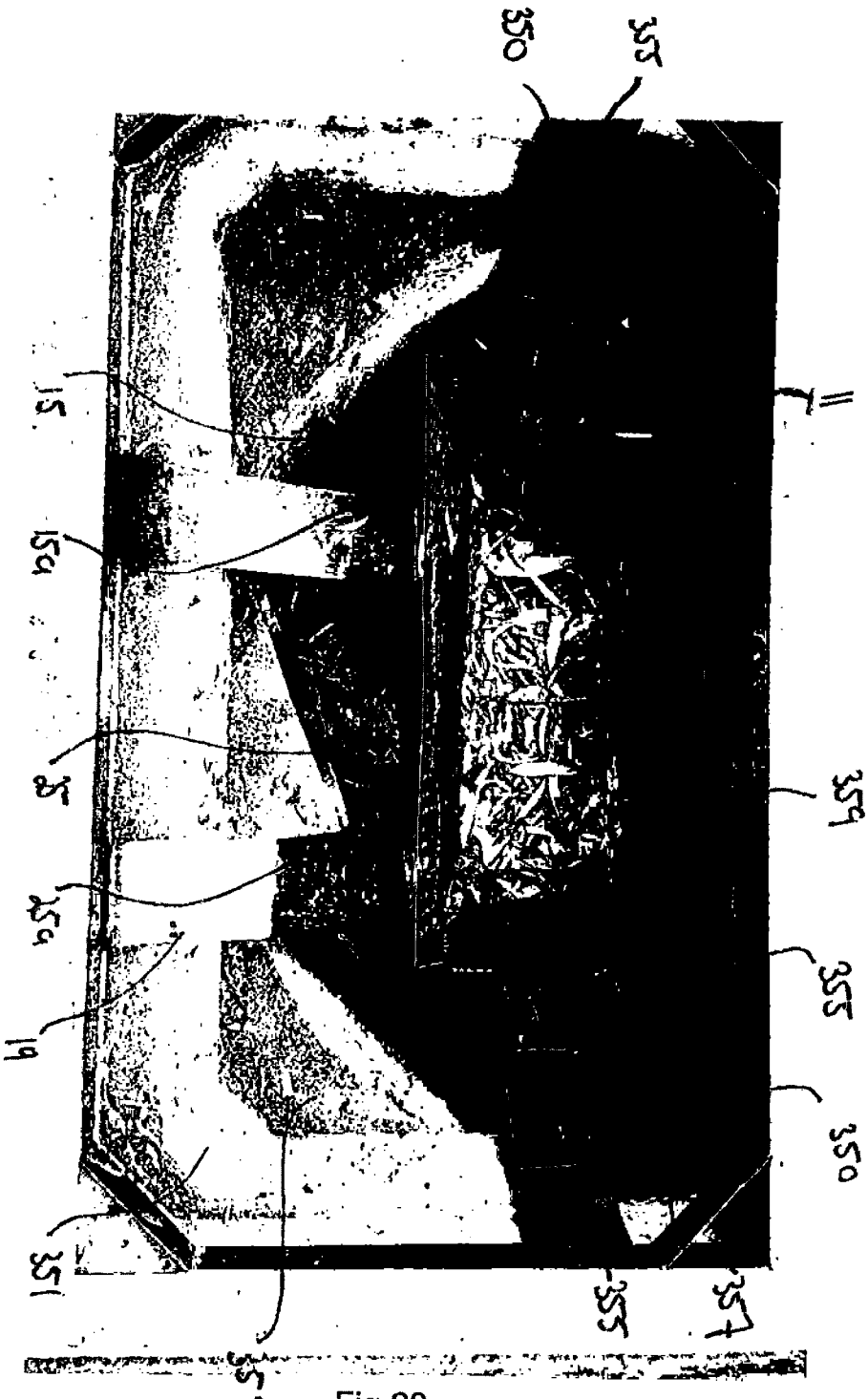

Fig 20

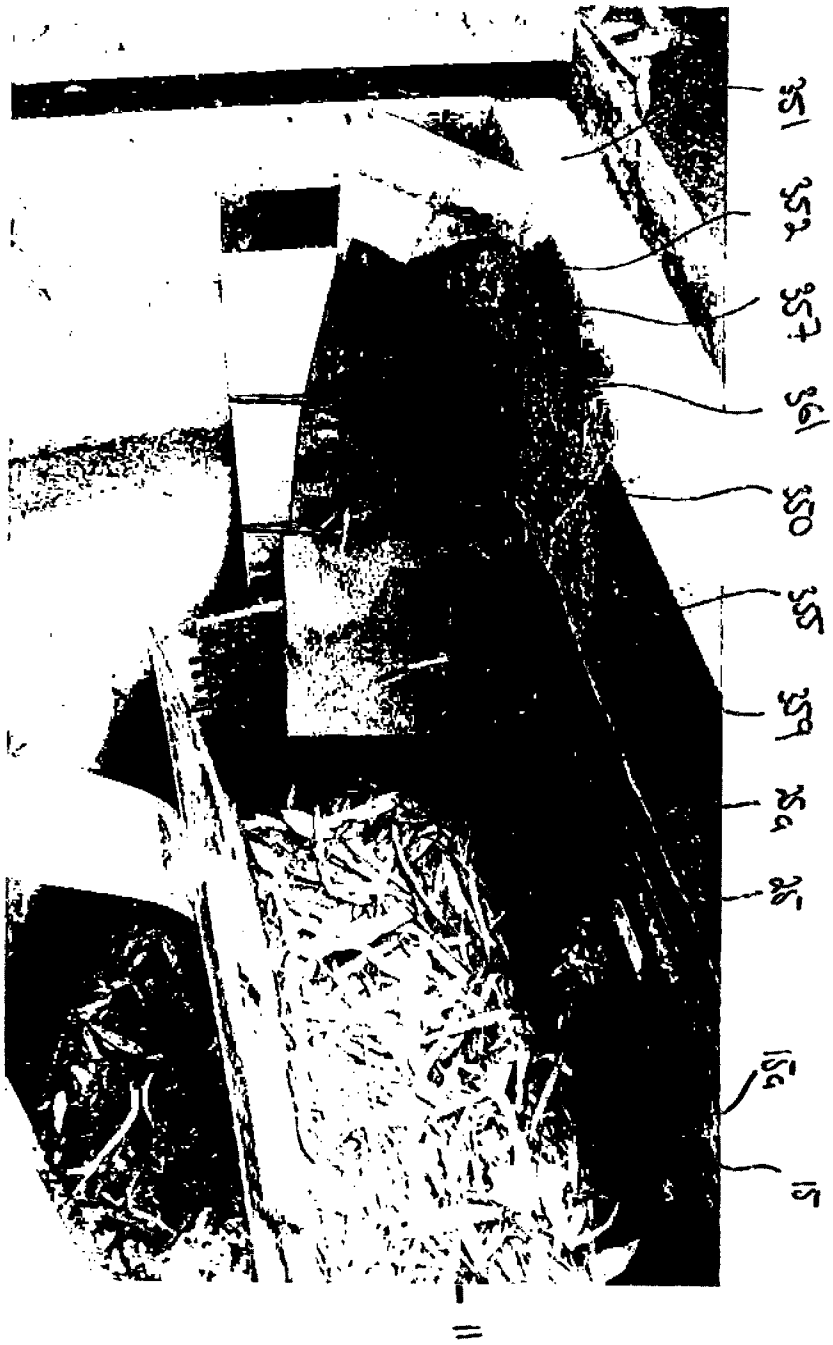

Fig 21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2015/000043

A. CLASSIFICATION OF SUBJECT MATTER

E02B 15/04 (2006.01) E03F 5/14 (2006.01) B01D 29/00 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPIAP, EPODOC: CPC, IPC: E03F 5/14, E02B 15/04, B01D 29 and keywords: filter, mesh, screen, trap, separate, strainer box, basket, net, insert, grate, rake, debris, leaf, collect, diffuse, disperse, dissipate, scatter, spread, drain, sewer, discharge, sump, dispose, cesspool, remove, replace, detach, move, second, multiple, plural, further, another and like terms.

The above keywords were also used in Google Patents.

Applicant/Inventor search in ESpace net/AUSPAT. (CRAIG ROTHLEITNER)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 March 2015	30 March 2015
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Ron Weber AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262833199

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2015/000043**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6537446 B1 (SANGUINETTI) 25 March 2003 columns 2 to 6 and figures 1 to 3.	1, 4, 5, 6, 9, 10, 12 to 15, 17 to 29, 31 and 32.
X	US 7112274 B1 (SANGUINETTI) 26 September 2006 Columns 2, 5 to 9 and figures 1 to 6.	1, 4, 7 to 19 and 21 to 32.
X	US 2006/0207922 A1 (DUSSICH I) 21 September 2006 Pages 1 and 2 and figures 1 and 3.	1 to 5, 7, 9 to 13, 24, 25, 27, 28, 29, 32, 33 and 34.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2015/000043**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 6537446 B1	25 March 2003	AU 2003270653 A1	30 Apr 2004
		US 2004011731 A1	22 Jan 2004
		WO 2004024288 A1	25 Mar 2004
US 7112274 B1	26 September 2006		
US 2006/0207922 A1	21 September 2006	US 7485218 B2	03 Feb 2009
		WO 2006102340 A2	28 Sep 2006

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.