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(71) Applicant(s):
E van Johnson
9 Tennyson Road, HOUNSLOW,
Middlesex, TW3 4AN, United Kingdom

(72) Inventor(s):
E van Johnson

(74) Agent and/or Address for Service:
Baron Warren Redfern
19 South End, Kensington, LONDON,
W8 5BU, United Kingdom

(51) INT CL:
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JP 070229172 A **JP 2004019272 A**
AU 2005/202689 A1
(Connaughton)

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INT CL **E03B**
Other: **wpi, epodoc**

(54) Abstract Title: **Rainwater storage system**

(57) A rainwater storage system suitable for mounting against a wall comprises (i) an inlet for receiving rainwater from a roof gutter, (ii) a plurality of storage tubes (7) and (iii) an outlet. Preferably, the top of the storage tubes (7) interconnects with an upper horizontal tube (8) above and one end (9) of the upper horizontal tube (8) is interconnected with an inlet tube (6). Suitably, the bottom of the storage tubes (7) interconnects with a lower substantially horizontal tube which has a slight gradient towards the inlet tube (6) and has an outlet which is connectable to a water consumption device via a conduit (17). Rainwater from the gutter is collected and stored in the tubes and the water consumption device draws stored water from the rainwater storage system via the outlet.

FIG. 1

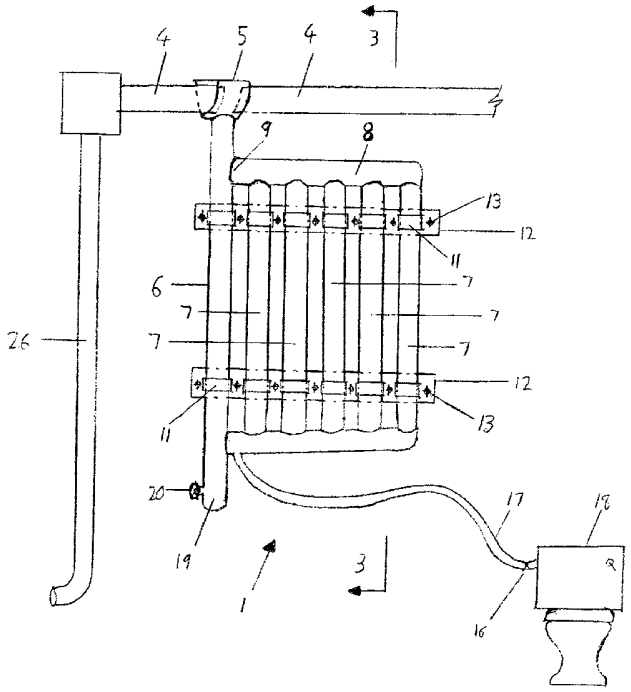

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FIG. 1

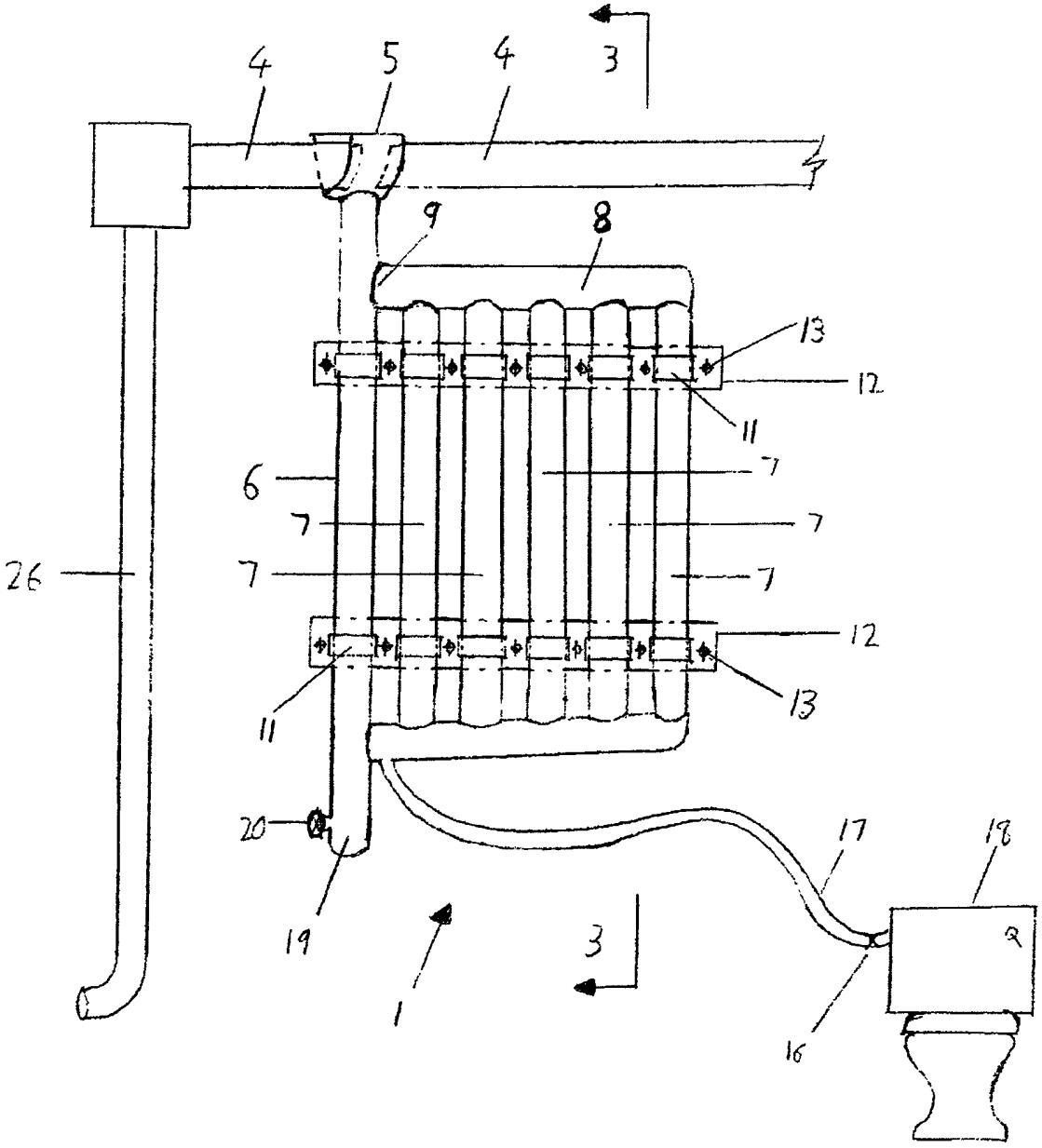
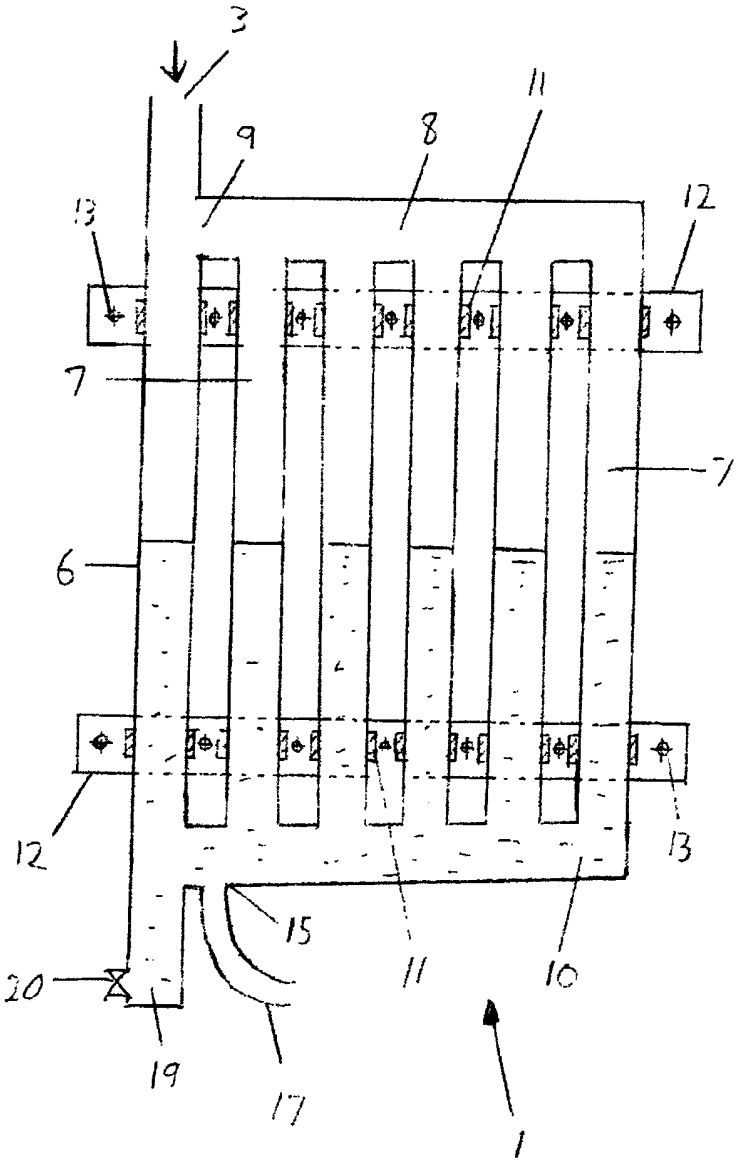


FIG. 2


3
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1

FIG. 3

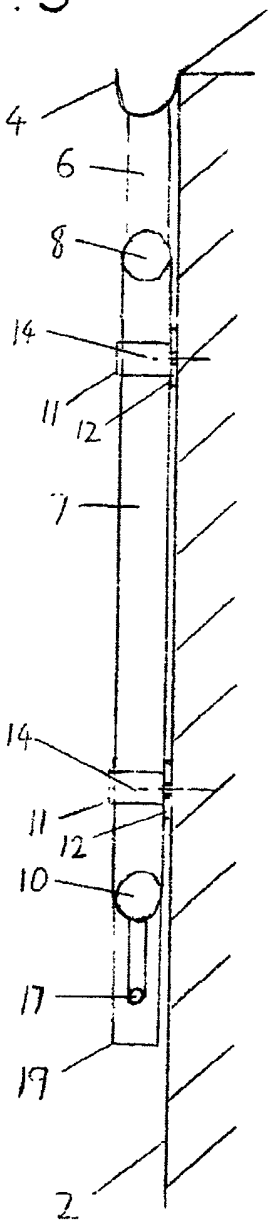
4
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FIG. 4

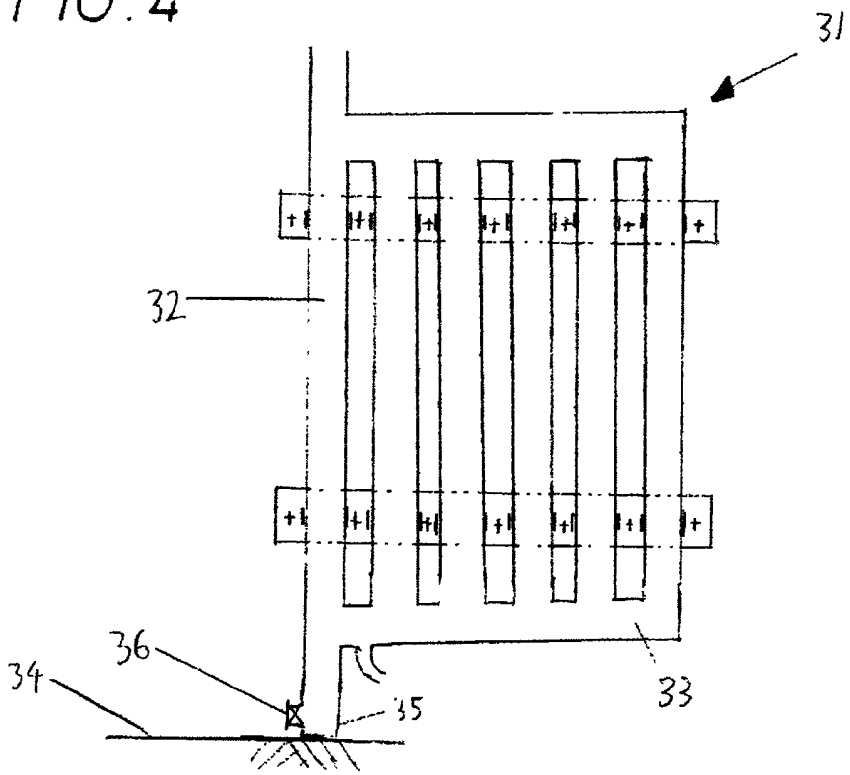


FIG. 5

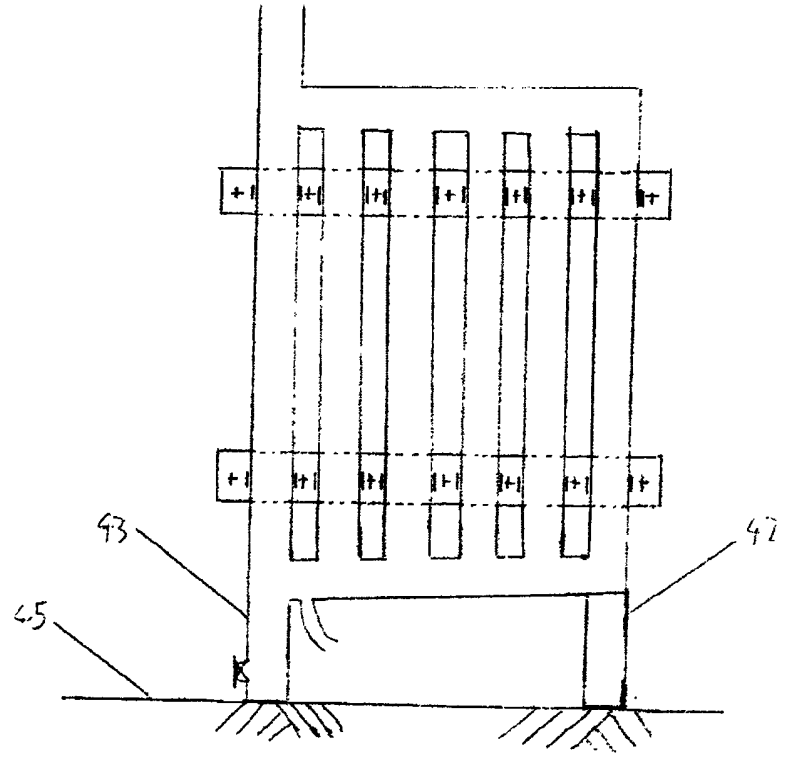
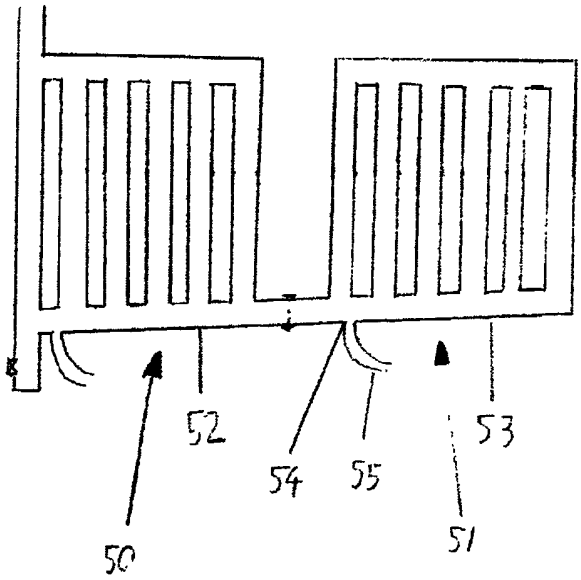


FIG. 6



RAINWATER STORAGE SYSTEM

The present invention relates to a rainwater storage system and particularly to a rainwater storage system for use with a building.

As new housing is built and occupied there is a greater need for potable or drinking water.

Reservoirs are built to collect drinking water and these reservoirs require large tracts of land and may require valleys to be dammed and flooded. To make the best use of the reservoirs they should be sited in areas where it is expected to have the greatest rainfall but there is a problem in that it is not absolutely certain where the rain will fall. Large pipelines and pumping stations are required to pump the collected water to end users who may be located a considerable distance from the reservoir. The pipelines and pumping stations require maintenance and there is the problem of combating leakage from the pipelines.

Another problem is that much potable water is not economically used by the end user as every time a toilet is flushed it uses potable water which then enters the sewers. There is no need for toilet flushing water to be potable.

It is an object of the present invention to alleviate the above-mentioned problems.

According to the present invention there is provided a rainwater storage system for mounting against a wall, comprising:

an inlet for receiving rainwater from a roof gutter;

an outlet from the system; and

a plurality of substantially parallel tubes for storing water received from the inlet, the tubes interconnected so as to permit fluid communication between each said tube and the inlet, and between each said tube and the outlet, wherein the outlet is connectable to at least one water consumption device which is arranged to draw stored water from the rainwater storage system via the outlet.

By connecting the rainwater storage system to a roof gutter of a building, rainwater running off the roof can thus be collected and can be used by a water consumption device as opposed to being channelled away by rainwater gutters and drains and either not being used or having to be conveyed over a long distance to a reservoir. This provides a "grey" or unpotatable water system. As there are buildings built in places where there are no reservoirs the buildings with the rainwater storage system can collect falling rain in those places. Thus, buildings that have collected sufficient water will use less potable water from existing potable water supplies. The system is likely to be most effective in winter when the optimum amount of water is generally available.

The system is an open flow system and can act as an external header tank. The system requires no power source since it relies solely on pressure from a head of water to provide water for one or more water consumption devices.

By mounting the rainwater storage system on a wall of a building, space is not required to be made available for storing rainwater within the building. Such space might not be available for a flat roof building.

By the system having a plurality of tubes for storing rainwater, the load is spread. If a single tank is provided, having a volume equivalent to that of the plurality of tubes, then the load provided by the tank may cause support problems.

The tubes are preferably arranged so as to be substantially vertical when the system is mounted for use.

One of the tubes may be aligned with the inlet.

The rainwater storage system may include a sump comprising a portion of one tube extending beyond the remaining tubes. The sump may comprise a portion of the tube aligned with the inlet.

The rainwater storage system may include a ground engagable portion to provide support for the system. At least one said tube may have a ground engagable portion which extends beyond the remaining tubes to provide a

support for the system. The at least one said tube having the ground engagable portion may comprise the tube aligned with the inlet. The system may include said ground engagable portion provided substantially at each opposite end of the system.

The tubes preferably have substantially the same cross-section although the tubes may be of any suitable size or shape.

The top of all of the substantially parallel tubes may be interconnected by a further tube so as to permit fluid communication of the substantially parallel tubes with each other and with the inlet. The bottom of all of the substantially parallel tubes may be interconnected by a further tube so as to permit fluid communication of the substantially parallel tubes with each other and with the outlet.

The interconnected tubes may comprise proprietary drainage components which may be uPVC components. By using proprietary components the rainwater storage system can be easily fabricated and would be inexpensive.

The rainwater storage system may include means for connecting the inlet to the roof gutter.

The rainwater storage system may include mounting means for mounting the system against the wall.

A plurality of rainwater storage systems may be interconnected so as to permit fluid communication between each other. Where a building comprises a plurality of flats, there may one rainwater storage system per flat.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying schematic drawings, in which:

Figure 1 is an elevational view of a rainwater storage system according to one embodiment of the invention connected to a roof gutter;

Figure 2 is a longitudinal sectional view of the rainwater storage system of Figure 1;

Figure 3 is a cross-sectional view taken along lines 3-3 of Figure 1;

Figures 4 and 5 are longitudinal sectional views of modified rainwater storage systems; and

Figure 6 is a longitudinal sectional view of two rainwater storage systems connected to each other.

Referring to Figures 1 to 3 of the accompanying drawings, a rainwater storage system 1 is mounted against a wall 2 of a building. The system 1 has an inlet 3 for receiving rainwater from a roof gutter 4 of the building via a connector 5 for connecting the inlet 3 to the gutter 4. The connector 5 is preferably located at the lowest point in the gutter 4.

The inlet 3 forms the top end of a vertical inlet cylindrical pipe or tube 6. The inlet tube 6 is parallel to a plurality of storage cylindrical pipes or tubes 7 which are of a shorter length than the inlet tube 6. The top of each storage tube 7 interconnects with an upper horizontal tube 8 situated above the storage tubes 7 and one end 9 of the upper horizontal tube 8 is interconnected with the inlet tube 6. The bottom of each storage tube 7 interconnects with a lower substantially horizontal tube 10 situated below the storage tubes 7. The lower substantially horizontal tube 10 has a slight downward gradient towards the inlet tube 6 for drainage purposes and is interconnected with the inlet tube 6.

The inlet tube 6 and storage tubes 7 are spaced apart and are held by tube brackets 11 fixed to boards 12 which are substantially perpendicular to the tubes 6,7. Each board 12 has fixing points or locations 13 for receiving fixings 14 which fix the rainwater storage system 1 to the wall 2.

The lower substantially horizontal tube 10 has an outlet 15 or take-off point located on its lowermost part. The outlet 15 is connected by a conduit 17 to a water consumption device 18 such as a toilet which has an associated valve 16.

The inlet tube 6 extends beneath the lower substantially horizontal tube 10 and the lowermost portion of the inlet tube 6 forms a sump 19. The sump 19 has a drain cock 20 or valve to enable water and/or debris to be removed from the inlet tube 6. The drain cock 20 is at or near ground level for ease of access.

The storage tubes 7 of the rainwater storage system 1 have the same cross-section and the inlet tube 6 and the upper and lower tubes 8,10 may also have the same cross-section as the storage tubes 7. All these tubes and their interconnections consist of proprietary drainage components. The brackets 11 are proprietary drainpipe/soil pipe fixing brackets.

In a preferred embodiment there are several storage tubes 7.

In use, rainwater is collected from the roof of the building by its gutter 4 and enters the inlet tube 6 of the rainwater storage system 1 via the connector 5. Water fills the portion of the inlet tube 6 below the lower substantially horizontal tube 10 before filling the conduit 17 to the water consumption device 18. Water continues to fill the inlet tube 6 and the storage tubes 7 via the lower substantially horizontal tube 10. When the storage tubes 7 are filled the upper horizontal tube 8 is then filled and the portion of the inlet tube 6 above the upper horizontal tube 8 is filled. Excess water from the roof gutter 4 unable to enter the rainwater storage system 1 is drained off via a conventional drainpipe 26.

When the water consumption device 18 requires water its associated valve 16 is opened to enable water stored in the system 1 to flow to the device 18 via the conduit 17.

In a modified rainwater storage system 31 illustrated in Figure 4, the inlet tube 32 extends beneath the lower substantially horizontal tube 33 to engage the ground 34 below the system 31 and provides a support for the rainwater storage system 31. Such support may be provided in addition to the fixings 14 as described above. The lowermost portion 35 of this tube 32 can also form a sump and the lowermost portion 35 also has a drain valve 36.

In another modified rainwater storage system 41 illustrated in Figure 5, a support tube 42 is located beneath the lower substantially horizontal tube 44 at the end furthest from the inlet tube 43 and is sealed from the rest of the system 41. The support tube 42 forms a ground engaging portion of the rainwater storage system 41 and along with the ground engaging portion of the inlet tube 43 provides support for the system 41.

Referring to Figure 6, first and second rainwater storage systems 50,51 are shown connected to each other. The lower substantially horizontal tube 52,53 of each system 50, 51 are extended so as to connect to each other. The second system 51 does not have an inlet tube extending to the roof gutter or forming a sump but it does have a separate outlet 54 connected by a conduit 55 to another water consumption device (not shown). In a modification, the second system does not have a separate outlet and conduit.

Whilst particular embodiments have been described, it will be understood that various modifications may be made without departing from the scope of the invention.

The rainwater storage systems have been illustrated as being mounted so that the storage tubes are to the right of the inlet tube. However, the system can be rotated through 180° so that the storage tubes are to the left of the inlet tube.

The portion of a tube 6,32,42,43 used as a sump or as a support from the ground does not have to be at a side of the system but can be at any suitable place beneath the arrangement of parallel tubes 7.

The tubes may alternatively or in addition be connected to the wall by other mounting means such as struts which support the tubes.

The rainwater storage system may be connected to any suitable number of water consumption devices 18 and these devices may be of different types.

A plurality of rainwater storage devices may be connected to each other in any suitable way. One or more of these systems can be connected to the roof gutter and one or more of these systems has an outlet connectable to at least one water consumption device.

Claims:

1. A rainwater storage system for mounting against a wall, comprising:

an inlet for receiving rainwater from a roof gutter;

an outlet from the system; and

a plurality of substantially parallel tubes for storing water received from the inlet, the tubes interconnected so as to permit fluid communication between each said tube and the inlet, and between each said tube and the outlet, wherein the outlet is connectable to at least one water consumption device which is arranged to draw stored water from the rainwater storage system via the outlet.

2. The rainwater storage system as claimed in claim 1, wherein the tubes are arranged so as to be substantially vertical when the system is mounted for use.

3. The rainwater storage system as claimed in claim 1 or 2, wherein one said tube is aligned with the inlet.

4. The rainwater storage system as claimed in claim 1, 2 or 3, including a sump comprising a portion of one said tube extending beyond the remaining tubes.

5. The rainwater storage system as claimed in claims 3 and 4, wherein the sump comprises a portion of said tube aligned with the inlet.

6. The rainwater storage system as claimed in any preceding claim, including a ground engagable portion to provide support for the rainwater storage system.

7. The rainwater storage system as claimed in any preceding claim, wherein at least one said tube has a ground engagable portion which extends beyond the remaining tubes to provide a support for the rainwater storage system.

8. The rainwater storage system as claimed in claims 3 and 7, wherein at least one said tube having said ground engagable portion comprises said tube aligned with the inlet.

9. The rainwater storage system as claimed in claim 6, 7 or 8, wherein said ground engagable portion is provided substantially at each opposite end of the system.

10. The rainwater storage system as claimed in any preceding claim, wherein the tubes have substantially the same cross-section.

11. The rainwater storage system as claimed in any preceding claim, wherein the top of at least two of the substantially parallel tubes are interconnected by a further tube so as to permit fluid communication of the substantially parallel tubes with each other and with the inlet.

12. The rainwater storage system as claimed in any preceding claim, wherein the bottom of at least two of the substantially parallel tubes are interconnected by a further tube so as to permit fluid communication of the substantially parallel tubes with each other and with the outlet.

13. The rainwater storage system as claimed in any preceding claim, wherein the interconnected tubes comprise proprietary drainage components.

14. The rainwater storage system as claimed in claim 13, wherein the proprietary drainage components comprise uPVC components.

15. The rainwater storage system as claimed in any preceding claim, including means for connecting the inlet to the roof gutter.

16. The rainwater storage system as claimed in any preceding claim, including mounting means for mounting the system against the wall.

17. The rainwater storage system as claimed in claim 16, wherein the support provides at least one fixing location for fixing the rainwater storage system to the wall.

18. A plurality of rainwater storage systems as claimed in any preceding claim, wherein the rainwater storage systems are interconnected so as to permit fluid communication between each other.

19. A rainwater storage system constructed substantially as hereinbefore described with reference to Figures 1 to 3 or Figure 4 or 5 of the accompanying drawings.

20. A plurality of rainwater storage systems constructed substantially as hereinbefore described with reference to Figure 6 of the accompanying drawings.

UK Intellectual Property Office

For Creativity and Innovation

Application No: GB0803179.1 **Examiner:** D. Haworth

Claims searched: 1-18 **Date of search:** 13 June 2008

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-3 at least	JP07229172 A (Oshizawa)
X	1 and 3 at least	JP2004019272 A (Yamamoto)
X	1-4 at least	AU 2005/202689 A1 (Connaughton)

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

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

E1X

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

E03B

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

wpi, epodoc

International Classification:

Subclass	Subgroup	Valid From
E03B	0003/03	01/01/2006