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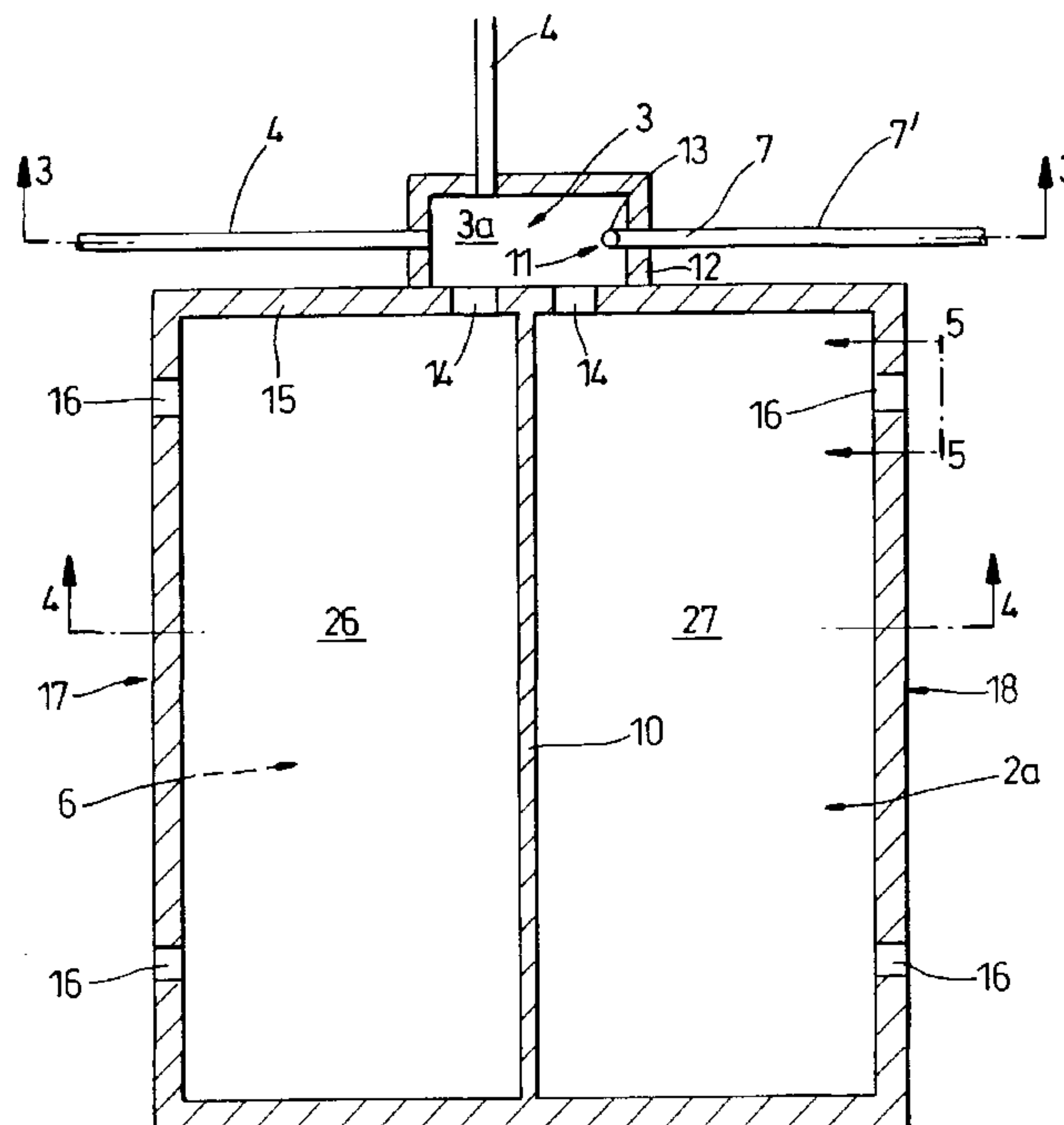
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(54) Title: APPARATUS FOR STORMWATER RETENTION AND RELEASE, AND METHOD OF USE THEREOF



(57) Abrégé/Abstract:

Apparatus and a method are aimed at reducing flood risk from stormwater draining from a property (1). The apparatus is adapted in use to retain stormwater at the property (1) releasing it from the property and comprises a container (6) which in use is located underneath or proximal to a building (2) of the property (1), and a control chamber (3) with which the container (6) is in fluid communication. The apparatus is operatively connected in use by at least one conduit (4) to drainage means (5) sourced externally from the building to receive stormwater into the container (6) by way of the control chamber (3), and is further operatively connected in use to at least a second conduit (7) to which stormwater exits from the container (6) by way of the control chamber (3). A level of stormwater in the control chamber (3) determines the inflow and outflow of stormwater into and from the container (6). Debris is prevented at the control chamber from entering into the container and passing to the second conduit (7). Stormwater may be pumped from the container for watering a garden or other uses. The property (1) may comprise a series of buildings (2), each with its own stormwater retention.

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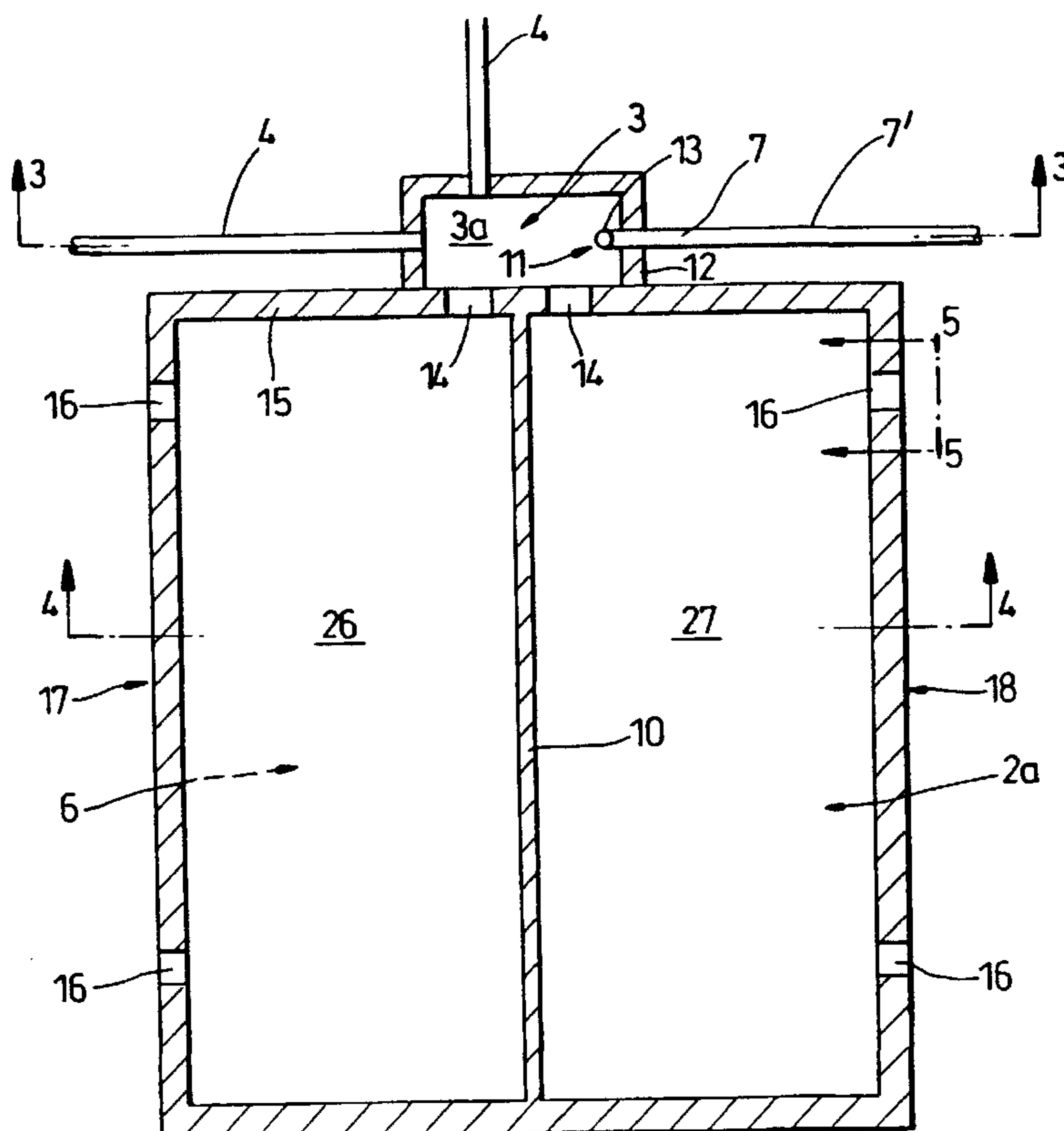
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(57) Abstract: Apparatus and a method are aimed at reducing flood risk from stormwater draining from a property (1). The apparatus is adapted in use to retain stormwater at the property (1) releasing it from the property and comprises a container (6) which in use is located underneath or proximal to a building (2) of the property (1), and a control chamber (3) with which the container (6) is in fluid communication. The apparatus is operatively connected in use by at least one conduit (4) to drainage means (5) sourced externally from the building to receive stormwater into the container (6) by way of the control chamber (3), and is further operatively connected in use to at least a second conduit (7) to which stormwater exits from the container (6) by way of the control chamber (3). A level of stormwater in the control chamber (3) determines the inflow and outflow of stormwater into and from the container (6). Debris is prevented at the control chamber from entering into the container and passing to the second conduit (7). Stormwater may be pumped from the container for watering a garden or other uses. The property (1) may comprise a series of buildings (2), each with its own stormwater retention.

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**APPARATUS FOR STORMWATER RETENTION AND RELEASE,
AND METHOD OF USE THEREOF**

This invention relates to apparatus for stormwater retention and release,
5 and a method of use thereof. The invention relates more specifically to,
but is not limited to, apparatus for stormwater retention and release from
a property development.

The term stormwater encompasses water deposited by the weather, and
10 includes snow, hail, rain and ice.

Property developments, especially residential developments, more
frequently require that stormwater draining from the property is retained
prior to its controlled release in order to reduce flood risks downstream of
15 the site, or to control flows of existing points of outfall with limited spare
capacity. Frequently, rates of stormwater discharge from property
developments are carefully controlled and restricted, certain controlled
rates being set to particularly low levels resulting in large balancing
means being necessary to retain the stormwater prior to its controlled
20 release.

The two most frequently used solutions to retain stormwater comprise
providing balancing means in the form of a pond or a relatively large tank
located in an open space area proximal to the development. If a tank is
25 provided, it may be located under a highway as part of a box culvert.
Stormwater collects in the tank or pond and is retained therein prior to
release through suitably dimensioned outlets into a local drainage
network, usually a sewer.

Ponds are less favoured by developers as they require regular maintenance, and controls connecting the pond to a local drainage network are susceptible to blockage by debris falling into or otherwise gaining access to the pond. Tanks, however, are expensive and also require
5 regular maintenance. Often, developable land must be sacrificed in order to accommodate the pond or tank.

Furthermore, ponds and tanks of the prior art type are laborious to install. Large sewers, usually in the form of relatively large diameter pipework,
10 or box culverts, must be installed underground which requires a significant amount of effort.

Whilst not concerned with control of stormwater control at property developments to reduce flood risks there is disclosure in EP 08253304 A2
15 of apparatus for separating floating and non-floating particulate from drain water in sudden storms and in steady prolonged rainfall. A tank is connected to inlet and outlet conduits to provide a level of drain water between the conduits and includes particulate containment chambers in which particulate is collected from the water passing through the bank
20 from the inlet to the outlet conduit. In one embodiment a detention basin is provided in combination with the tank into which excessive drain water resulting from higher than usual water flow rates is diverted from the tank. Drain water from the detention basin returns to the tank by a one-way valve for exit from the outlet conduit once the sudden influx of
25 water has passed. The diverted water enters the detention basin at a much higher level than the entry to the outlet conduit, which is in the lower region of the tank. The one-way valve is at the level of the entry to the outlet conduit so that the water is encouraged to leave the detention basin as soon as the sudden influx of water passes. This disclosure is

essentially concerned with removal of particulate in a sewer system rather than drain water storage to reduce flood risks.

DE 29611700 U1 discloses the collection of rainwater underneath a building but this is to provide a reservoir of the water for pumping to shower/washing facilities in the building and is not intended to reduce flood risk at a property. Drainage pipes simply feed and drain water directly into and from the foundations of the building where the water is collected.

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There is a need in the art for apparatus which can effect stormwater retention and, where necessary, controlled release of stormwater from a property development, which overcomes problems discussed above.

15 According to a first aspect of the invention there is provided stormwater retention apparatus adapted in use to retain stormwater prior to release of the stormwater from a property comprising:

a closed container which in use is located underneath or proximal to a building of the property, being operatively connected in use by at least one inlet conduit to drainage means sourced externally from the building to receive stormwater into the container, and being further operatively connected in use to at least one outlet conduit by which stormwater is led away from the container and

20 a control chamber with which the container is in fluid communication and through which stormwater enters, to be stored in, and leaves the container when the stormwater reaches a determining level (W) in the control chamber spaced above the base of the container,

characterised in that the inlet and outlet conduits are connected to the control chamber and thereby to the container, and that the outlet conduit comprises an end portion which passes out of the control chamber

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and includes an entry spaced above the determining level (W) by which stormwater can pass from the control chamber into the end portion to exit from the control chamber, and which by being spaced above the determining level (W) allows stormwater to collect in the container and
5 control chamber above the determining level (W).

The property may be one of a series of properties on a property development. Preferably each property in such a development has stormwater retention apparatus according to the first aspect of the
10 invention, the stormwater exiting from the container of each apparatus into a local sewer.

Preferably the container is subterranean, located under part of the property. Where the property is a house having a garage, the container is
15 conveniently located under the garage, for example.

Advantageously, no pond or tank is required, freeing all available developable land. As the container of the or each stormwater retention apparatus and its conduits are of a considerably smaller scale than prior
20 art ponds and tanks, considerably less effort is required to install apparatus according to the first aspect of the invention.

Furthermore, the apparatus is less susceptible to blockage as very little debris can gain access to the container as it may be sealed off from the
25 environment. Small amounts of debris, such as leaves, may enter the container via the drainage means fitted to the property, but in general are not sufficient to block the entry to the outlet conduit.

Preferably the container is incorporated in the foundations of the property
30 during construction of the property. Preferably the container is made at

least in part of bricks and mortar, and may be lined with cement. A waterproof lining may be added to the inside surfaces of the container to prevent leaks occurring.

- 5 Drainage means fitted externally to the property preferably comprises guttering and drainpipes which collect stormwater falling on the property, channelling the stormwater to the base of the property and into the container. The drainage means may, however, be any suitable drainage means which is operatively connectable to the container.

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The inlet and outlet conduits may be pipes of relatively narrow diameter, for example 75mm or 100mm.

- 15 Where the discharge from the property is rate limited, the apparatus may include suitable exit rate limiting means. The exit rate limiting means may include a Hydrobrake (Registered Trade Mark). The outlet conduit may include an orifice which is suitably dimensioned so as to restrict the flow of stormwater through the orifice to a predetermined level.

- 20 Where no discharge rate applies, no exit rate limiting means is required. In either case, the need for a large tank or pond is obviated by the provision of apparatus according to the first aspect of the invention.

- 25 Stormwater entering the container must first pass through the control chamber. The control chamber may be located above or below ground level, or may be partially below ground level. The chamber may be below ground level at a level relating to the invert of the container. The control chamber may be attached to the side of the property underneath which the container is located.

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The control chamber may be operatively connected to the container by a hole or holes located in a wall separating the container and the control chamber. The control chamber may be raised above the level of the container to create a split-level stormwater retention apparatus, the stormwater entering the control chamber and passing under gravity into the container via a hole or holes in the separating wall proximal to the base of the control chamber.

The outlet conduit may comprise at least one outlet pipe, an end portion of which sealingly passes through a hole in a wall of the control chamber. The end portion preferably includes a bend, preferably at 90°, so that one open end of the outlet pipe is directed upwards, away from the base of the control chamber. In the wall of the pipe on the underside of the bend, opposite to the base of the control chamber, a suitably dimensioned orifice may be provided at a selected level through which a restricted flow of stormwater can pass out of the control chamber when the stormwater in the control chamber reaches that level.

As the stormwater level rises in the control chamber, the orifice does not become obstructed as debris floating in the stormwater also rises. When the stormwater level rises above the height of the orifice, a small jet is created from the orifice into the pipe, operating under a head of stormwater and ensuring that the orifice remains free of debris.

The control chamber may, at its base, be fitted with a silt trap in which biodegradable debris such as leaves can collect without blocking the passage of stormwater into or out of the container. A weir or weirs to the inlet conduit or conduits may also prevent any solid passing to the container or obstructing the orifice.

In the above-described form of the outlet conduit, the upwardly-directed open end of the outlet pipe acts as an overflow outlet. If the stormwater level in the container rises above the level of the open end of the outlet pipe, stormwater enters the pipe via the open end of the pipe (in addition to exiting via the orifice situated on the underside of the bend portion of the outlet pipe). The open end is preferably capped with a device which prevents debris entering the outlet pipe in the event of an overflow. The device may be a bird-cage cap to prevent debris accessing the outlet pipe and rodent access into the container from a downstream sewer network.

10

In order to prevent condensation and damp causing damage to the foundations and underside of the property above the container, air bricks may be included in the upper regions of the foundations to allow venting of water vapour. The air bricks may be provided with insect screens to prevent debris entering the container. The air bricks may also provide a second means of overflow.

20

Polythene membranes or other waterproof coating such as "SYNTHAPRUFE" (Registered Trade Mark) could be used to line the walls or underside of the floor of the property to protect the property from structural damage caused by damp. In this way, the property is protected from the deteriorating effects of damp as condensation is isolated by the membranes. In any event, it is designed so that stormwater would normally only be retained in the container for a relatively short period after entering the container.

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A pump may be provided which pumps stormwater out of the container to recycle the stormwater for other uses, such as watering a garden, flushing toilets or washing a car.

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According to a second aspect of the invention there is provided a property comprising a building characterised in that it includes stormwater retention apparatus according to the first aspect of the invention

- 5 According to a third aspect of the invention, there is provided a method of retaining and controlling discharge of stormwater collected by drainage means fitted to a building, the method comprising the steps of collection of stormwater by said drainage means, retention of the stormwater by stormwater retention apparatus according to the first aspect of the
10 invention, and controlled release of the retained stormwater by the stormwater retention apparatus into local drainage facilities.

There now follows, by way of example only, a detailed description of an embodiment of the invention with reference to the accompanying drawings
15 of which:

Figure 1 shows a plan view of two adjacent properties of a property development which include apparatus according to the first aspect of the invention;
20

Figure 2 shows a plan view of apparatus according to the first aspect of the invention provided underneath adjoining garages of the two properties of Figure 1;

25 Figure 3 is an enlarged sectional view along the line 3-3 of a control chamber of the apparatus shown in Figure 2;

Figure 4 is a sectional view along the line 4-4 of a container of the apparatus shown in Figures 2;
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Figure 5 is a fragmentary sectional view of the floor of one of the garages looking in the direction of the arrows 5-5 in Figure 2;

8

Figure 6 is a sectional view of an alternative embodiment of the control chamber; and

Figure 7 is a plan view of the control chamber of Figure 6.

5

Figure 1 shows part of a property development 1, the part comprising two adjacent houses 2 with adjoining garages built as a divided double garage 2a. Adjacent the double garage 2a is a control chamber 3. The control chamber 3 is located underground, adjacent the foundations (see Figure 3) of the double garage 2a. Conduits in the form of inlet pipes 4 feed stormwater into the control chamber 3 from the drainage means 5 of the adjacent houses 2 and the garage itself 2a. The drainage means 5 generally comprises drainpipes and guttering which collect stormwater falling on the property. A container 6 (see Figure 2) located under the double garage is operatively connected to the control chamber 3. Walls of the container 6 are defined by the footings of the walls of the double garage 2a, as can be seen in Figure 4.

The control chamber 3 may have a concrete base, brick walls and be closed at the top by an access cover. Alternatively, it may be a pre-formed unit, for example of a suitable plastics material such as upvc.

An outlet conduit 7 allows stormwater to exit from the control chamber 3. The conduit 7 merges with other conduits 7' carrying stormwater from further properties (not shown), feeding the stormwater into a sewer 8 running beneath a nearby road 9.

The double garage 2a, the control chamber 3 and the conduits 4,7 can be seen in more detail in Figure 2.

30

The garage 2a, as shown in Figure 2, is rectangular in plan and divided along its length into halves by a partition wall 10. The control chamber 3 is also rectangular in plan, although any suitable dimensions which allow the control chamber 3 to be located proximal to the foundations of the garage 2a would suffice. The partition wall divides the container into two equally-sized sub-chambers 26,27.

Inlet conduits 4 in the form of pipes feed stormwater into the control chamber 3. The outlet conduit 7 also in the form of a pipe provides an outlet for stormwater from the control chamber 3. The inlet and outlet conduits 4, 7 are typically 75mm or 100mm diameter. The outlet conduit 7 includes an end portion 11 which sealingly passes through a wall 12 of the control chamber 3 and has an upwardly-directed open end 13.

15

Holes 14 in a wall 15 of the container, separating the control chamber 3 and the container 6, allow water to pass from the control chamber 3 into the two sub-chambers 26, 27 of the container 6, and vice-versa.

20 Air bricks 16 at the base of opposite side walls 17,18 of the garage 2a allow venting of water vapour in the container 6. The air bricks 16 also provide another means of overflow.

In Figure 3 the control chamber 3 of Figures 1 and 2 can be seen in detail. Inlet pipes 4, delivering water from the drainage means of the property, enter the control chamber 3 at a fixed height above the base 3a of the control chamber 3. The soffit of the inlet pipes 4 is typically approximately 25mm above the maximum possible level of stormwater in the control chamber 3, as indicated by the line M, to prevent the inlet pipes 4 becoming surcharged. If water level is above the stormwater

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delivery height of the inlet pipes 4, the pipes would become surcharged, impeding the flow of stormwater into the control chamber 3.

5 The end portion 11 of the outlet conduit 7 has a bend 19, from which the end portion extends upwards away from the base 3a of the control chamber 3 to the open end 13. The open end 13 is fitted with a bird cage cap 20, which prevents debris entering the outlet pipe 7 and causing a blockage. This also prevents rodents entering the system from the downstream sewer network 8.

10

An orifice 21 is formed in the underside of the bend 19 of the end portion 11. As the water level in the control chamber rises, stormwater enters the outlet conduit 7 through the orifice 21, as indicated by the arrow X, thereby exiting in a restricted flow from the control chamber 3
15 into the nearby sewer 8.

The position of the orifice 21 in the bottom of the bend of the end portion 11 of the outlet conduit prevents debris collecting in the orifice 21 after the water level has fallen. Debris in the control chamber 3 may rise
20 with the water level to, and above, the level of the orifice 21 but after the water level has dropped, gravity prevents debris accumulation in the orifice 21. Furthermore, when stormwater gathers in the control chamber to a level above the level indicated by the line W in Figure 3, the orifice 21 is submerged in the stormwater, and a restricted flow of stormwater
25 escapes into the outlet conduit 7, through the orifice 21, generating a flume in the outlet conduit from the orifice 21 which ensures that the orifice 21 cannot become blocked.

The holes 14 in the wall 15 between the control chamber 3 and the container 6 allow stormwater to enter the container 6 when the water level in the control chamber rises above the water level W.

- 5 The container 6 has a closed roof formed by the underside of a block and beam floor 23 of the double garage 2a. A water proofing membrane, for example of SYNTHAPRUFE 22 (Registered Trade Mark), is applied to the underside of the roof of the container. This waterproofing membrane protects the garage 2a from damp effecting steel work in the beams of the
10 floor 23.

In addition, the air bricks 16 allow the escape of excess stormwater from the container 6, for example in the event of extreme flooding or collection of stormwater in the container 6, caused by downstream obstruction.

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- The base 25 of the container 6 is lined with a layer, typically 75mm thick, of smooth formed concrete 28. A polythene membrane 29, typically 1200g on 50mm sand blinding, ensures against water escaping from the container 6 to attack the foundations 24. It also diminishes the possibility
20 of the occurrence of ground heave in clay subsoils.

- In Figure 5, a section of the garage floor 23 can be seen showing the position of the air bricks 16 in the side walls 17,18 of the garage. The floor typically comprises 100mm thick blocks 31 and P.C. concrete beams
25 32, lined with an A96 mesh 33 and covered with a 50mm structural topping 34. Each air brick 16 is fitted with an insect screen 35 to prevent debris entering the container 6.

- In use, stormwater is collected and drained from the property by the
30 drainage means 5 provided on the property 2,2a. The stormwater passes

through outlet pipes 4 and enters the control chamber 3 at the double garage 2a.

Stormwater continues to enter the control chamber 3 until the water level
5 W is reached. Once the water level rises above the water level W (as shown in Figure 3), stormwater begins to drain into the adjacent subterranean container 6 located underneath the garage 2a.

As the stormwater drains into the container 6, it also enters via orifice 21
10 the outlet pipe 7 and is directed to the nearby sewer 8, joining stormwater draining from neighbouring properties (not shown) on the way.

In the event of serious flooding, when the water level in the container 6 rises above the level M (as shown in Figure 3), stormwater can then leave
15 also by way of the open end 13 of the pipe 7, which functions as a stormwater overflow in the control chamber 3. Furthermore, if the container 6 is filled to capacity with stormwater through obstruction, the excess stormwater can escape through the air bricks 16 located in the side walls 17,18 of the double garage 2a.

20

An alternative embodiment of the control chamber is shown in Figures 6 and 7. This chamber 3 is formed solely from plastics material, preferably UPVC. As such it is easily located adjacent to the container 6 shown in Figure 2. It may be attached to a wide variety of other storage
25 containers.

The control chamber 3 is functionally very similar to the hand-built embodiment of Figure 3. It is of broadly cylindrical form, with a preferred diameter of approximately 475mm. Two inlet pipes 4,
30 preferably of approximately 100mm diameter each, lead into an outer

section 36 of the control chamber 3, which is separated by a weir 37 from an inner section 38 of the control chamber 3. The weir 37 provides a trap for silt and debris, preventing this from entering the inner section 38 of the control chamber.

5

An outlet pipe 39 replaces the holes 14 as the inlet to the container 6. It leads from the inner section 38 of the control chamber 3 to the container. The pipe 39 is preferably of approximately 150mm diameter. As water in the control chamber rises stormwater enters the outlet conduit from the
10 outer section 36 of the control chamber through the orifice 21 in the bottom of the outlet conduit.

The water accumulates in the outer section 36 of the control chamber 3. As the water level in this section rises silt and debris settles to the bottom
15 of the outer section 36 and only water decants over the weir 37 to the inner section 38 of the control chamber.

The outlet 39 allows stormwater to enter the container 6 when the water rises above the water level W. In the event of serious flooding, when the
20 water level in the container rises above the level M, stormwater can then leave also by way of the open end of the pipe 7, which functions as a stormwater overflow in the control chamber 3.

Studies have shown that when collection of stormwater in the control
25 chamber 3 and container 6 abates, the water level therein typically tends to fall by approximately 50mm each half hour. Therefore, in the occurrence of a thirty year storm event, the storage, comprising the container 6 and the control chamber 3, would empty in one and a half hours and in the occurrence of a one hundred and fifty year storm event,
30 the storage would empty in two and a quarter hours.

The controlled discharge from the control chamber and container is, in a preferred example of the embodiment described, limited by the orifice 21 to 1 litre per second. As a result, the flow through the sewer system 8
5 will be greatly reduced, thereby enabling installation of smaller capacity off-site storm sewers and the possible elimination of balancing, or reduction of size of balancing. By distributing the storage throughout the development within a private drainage system, the maintenance responsibilities of the Water Authority will also be greatly reduced.

10

The risk of downstream flooding is significantly reduced. If conduits draining a large balancing pond or tank of the prior art type become blocked, localised flooding could occur. Flood risks are significantly reduced by distributing several storage areas, as shown in the example,
15 around the property development 1.

In the event of, for example, a 300mm diameter sewer being used instead of a 600mm diameter sewer at a property development, by use of the apparatus according to the first aspect of the invention, the developer will
20 save in costs of materials, there will be a reduction in dig (to install the sewer) and the adjacent foul sewer will be made shallower in the case of a dual trench sewer construction. Furthermore, considerable savings will be made by the possible elimination of a balancing means such as a large tank or pond on land which could otherwise be used for development.

25

Once the water level in the container 6 has fallen, there will be a reservoir of stormwater in the container which cannot escape through the holes 14 into the control chamber 3 as the water level is not sufficiently high. This creates a permanently wetted area beneath the garage,
30 typically approximately 3m³ per dwelling. Typically, in the double garage

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2a, this means deepening the garage tanking by approximately 120mm per dwelling.

The permanently wetted area may be used to provide water, for example,
5 for washing a car, flushing a toilet or watering the garden if a suitable pump is fitted.

CLAIMS

1. Stormwater retention apparatus adapted in use to retain stormwater
5 prior to release of the stormwater from a property (1) comprising:
a closed container (6) which in use is located underneath or
proximal to a building (2) of the property, being operatively connected in
use by at least one inlet conduit (4) to drainage means sourced externally
from the building (2) to receive stormwater into the container (6), and
10 being further operatively connected in use to at least one outlet
conduit (7) by which stormwater is led away from the container (6) and
a control chamber (3) with which the container is in fluid
communication and through which stormwater enters, to be stored in, and
leaves the container when the stormwater reaches a determining level (W)
15 in the control chamber spaced above the base of the container,
characterised in that the inlet and outlet conduits (4, 7) are
connected to the control chamber (3) and thereby to the container, and
that the outlet conduit (7) comprises an end portion (11) which passes out
of the control chamber (3) and includes an entry (13) spaced above the
20 determining level (W) by which stormwater can pass from the control
chamber into the end portion to exit from the control chamber, and which
by being spaced above the determining level (W) allows stormwater to
collect in the container and control chamber above the determining
level (W).
25
2. Stormwater retention apparatus according to claim 1 characterised
in that the inlet conduit (4) is above the level of the entry (13) of the end
portion (11) of the outlet conduit (7).

3. Stormwater retention apparatus according to claim 1 or claim 2 characterised in that the outlet conduit (7) is adapted for fluid communication with a local drainage network (8) on exit from the container (6).

5

4. Stormwater retention apparatus according to any preceding claim characterised in that the outlet conduit (7) is adapted for fluid communication with a system for re-using the stormwater.

10 5. Stormwater retention apparatus according to any preceding claim characterised in that the container (6) is less than 7m³.

6. Stormwater retention apparatus according to any preceding claim characterised in that the container (6) is made at least in part of bricks
15 and mortar and is lined with a damp proof membrane (22) and concrete.

7. Stormwater retention apparatus according to any preceding claim characterised in that the inlet and outlets conduits (4, 7) are pipes.

20 8. Stormwater retention apparatus according to claim 7 characterised in that the pipes have a diameter of 75mm to 150mm.

9. Stormwater retention apparatus according to any preceding claim characterised in that exit rate limiting means is provided whereby the rate
25 of discharge from the apparatus is limited.

10. Stormwater retention apparatus according to any preceding claim characterised in that the end portion of the outlet conduit (7) has an orifice (21) in the control chamber at the determining level (W) whereby a
30 restricted flow of stormwater is allowed to pass through the orifice (21)

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into the outlet conduit when stormwater reaches the determining level (W) in the control chamber and before the level of stormwater in the control chamber reaches the entry (13) of the end portion (11).

- 5 11. Stormwater retention apparatus according to claim 10 characterised in that the end portion (11) has a substantially 90° bend (19) whereby one open end of the end portion (11) is directed upwardly away from the base of the control chamber (3) and forms the entry (13), and the orifice (21) is provided in the end portion (11) at an underside of the bend (19).
- 10 12. Stormwater retention apparatus according to any preceding claim characterised in that the control chamber (3) is located for use below ground level.
- 15 13. Stormwater retention apparatus according to any preceding claim characterised in that the control chamber (3) and the container (6) are so related in use that the stormwater passes under gravity from the control chamber (3) into the container (6).
- 20 14. Stormwater retention apparatus according to any preceding claim characterised in that the control chamber (3) further comprises a trap (37) for debris.
- 25 15. Stormwater retention apparatus according to claim 14 characterised in that the trap comprises a weir (37) between a part of the control chamber (3) at which stormwater is received from the inlet conduit (4) and a part of the control chamber (3) in fluid communication with the container (6).

19

16. Stormwater retention apparatus according to any preceding claim characterised in that the outlet conduit (7) further comprises means (20) at the entry (13) to prevent debris entering the outlet conduit from the control chamber (3) and prevents access for rodents into the control
5 chamber from the outlet conduit.

17. Stormwater retention apparatus according to claim 16 characterised in that the means (20) comprises a bird-cage cap fitted to the entry (13).

10 18. Stormwater retention apparatus according to any preceding claim characterised in that it further comprises a pump means for expelling stormwater from the container (6).

15 19. A property (1) comprising a building (2) characterised in that it includes stormwater retention apparatus according to any of claims 1 to 18, the container of which is located underneath or proximal to the building (2).

20 20. A property (1) according to claim 19 characterised in that it comprises a series of buildings (2) each of which has stormwater retention apparatus according to any of claims 1 to 18, the stormwater retained at each apparatus exiting from the container (6) thereof by way of the respective control chamber (3) into a communal local sewer or water course (8).

25

21. A property (1) according to claim 19 or 20 characterised in that the container (6) of the or each stormwater retention apparatus is located underground.

20

22. A property (1) according to any of claims 19 to 21 characterised in that the or each building (2) comprises a house having a garage (2a), the container (6) of the or each stormwater retention apparatus being underneath the garage.

5

23. A property (1) according to any of claims 19 to 22 characterised in that the or each container (6) is incorporated into the foundations of the or the respective building (2).

10 24. A property (1) according to any of claims 19 to 23 characterised in that the drainage means (5) to which the or each stormwater retention apparatus is operatively connected comprises guttering and drainpipes which channel the stormwater to the base of the or the respective building (2) and into the container (6) of the apparatus.

15

25. A property (1) according to any of claims 19 to 24 characterised in that air bricks (16) are provided in the portions of the or each building (2) proximal to the or the respective container (6).

20 26. A property (1) according to any of claims 19 to 25 characterised in that condensation isolation means (22) is provided adjacent the container (6) of the or each stormwater retention apparatus to protect the or the respective building (2) from the effect of damp.

25 27. A property (1) according to claim 26 characterised in that the condensation isolation means (22) comprise polythene membranes, and a waterproof coating.

21

28. A method of retaining and controlling discharge of stormwater collected by drainage means (5) fitted to a building (2), the method comprising the steps of:

collection of stormwater by said drainage means (5);

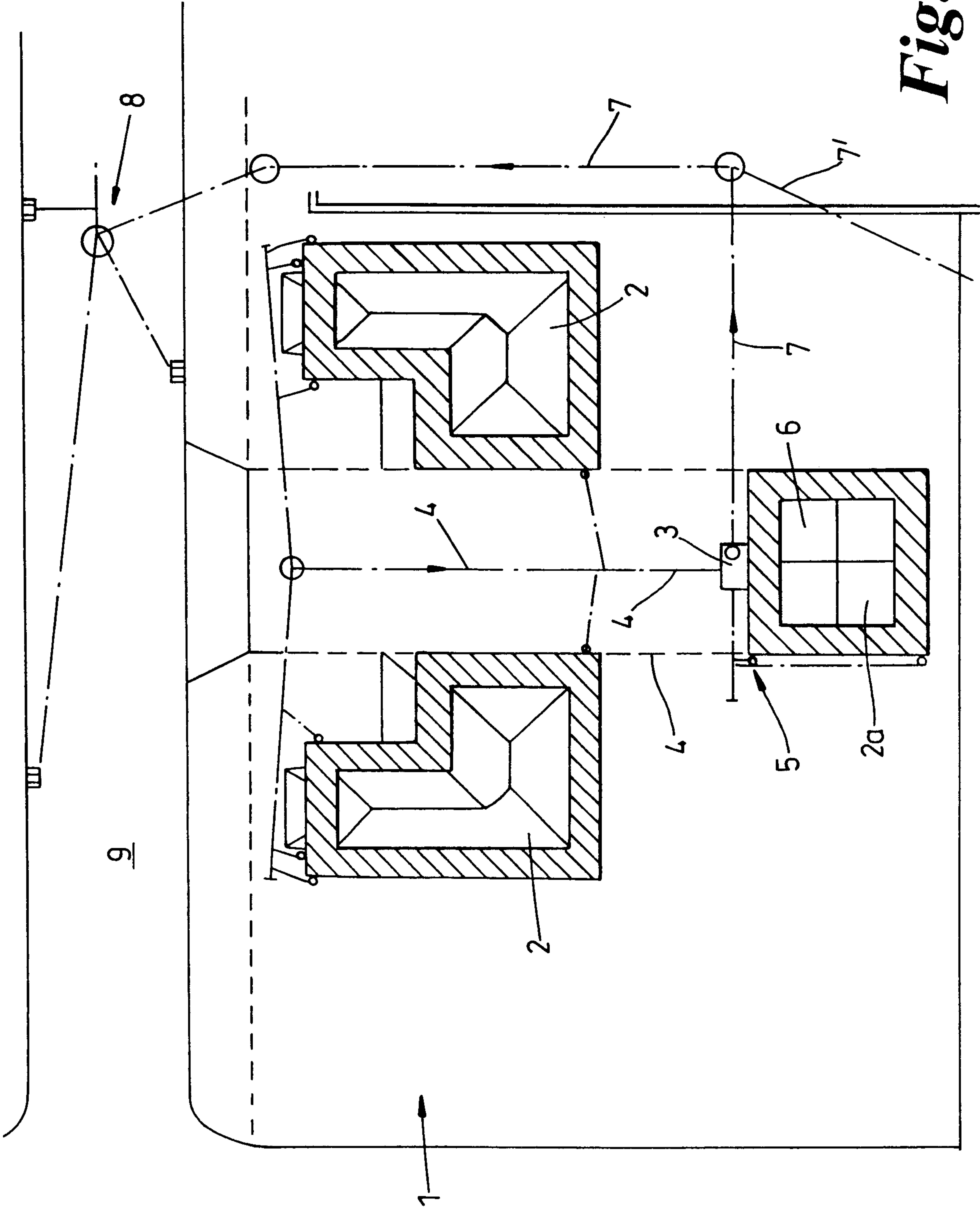
5 retention of the stormwater by stormwater retention apparatus according to any of claims 1 to 18; and

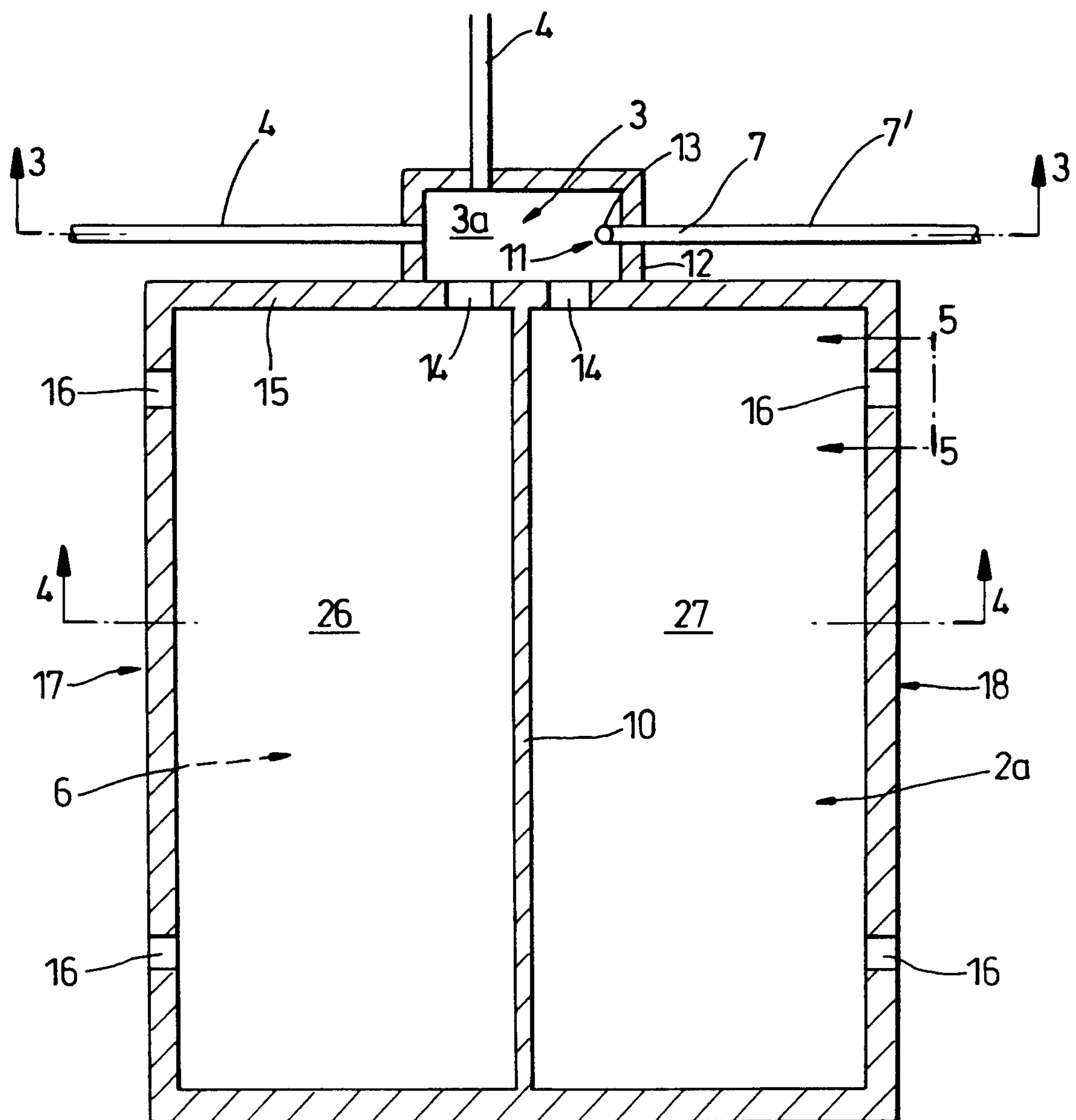
controlled release of the retained stormwater by the stormwater retention apparatus into local drainage facilities (8).

10 29. A method of retaining and controlling discharge of stormwater according to claim 28 characterised in that the stormwater retention apparatus has the container (6) for retention of the stormwater underneath a garage (2a) of the building (2).

15

Fig. 1



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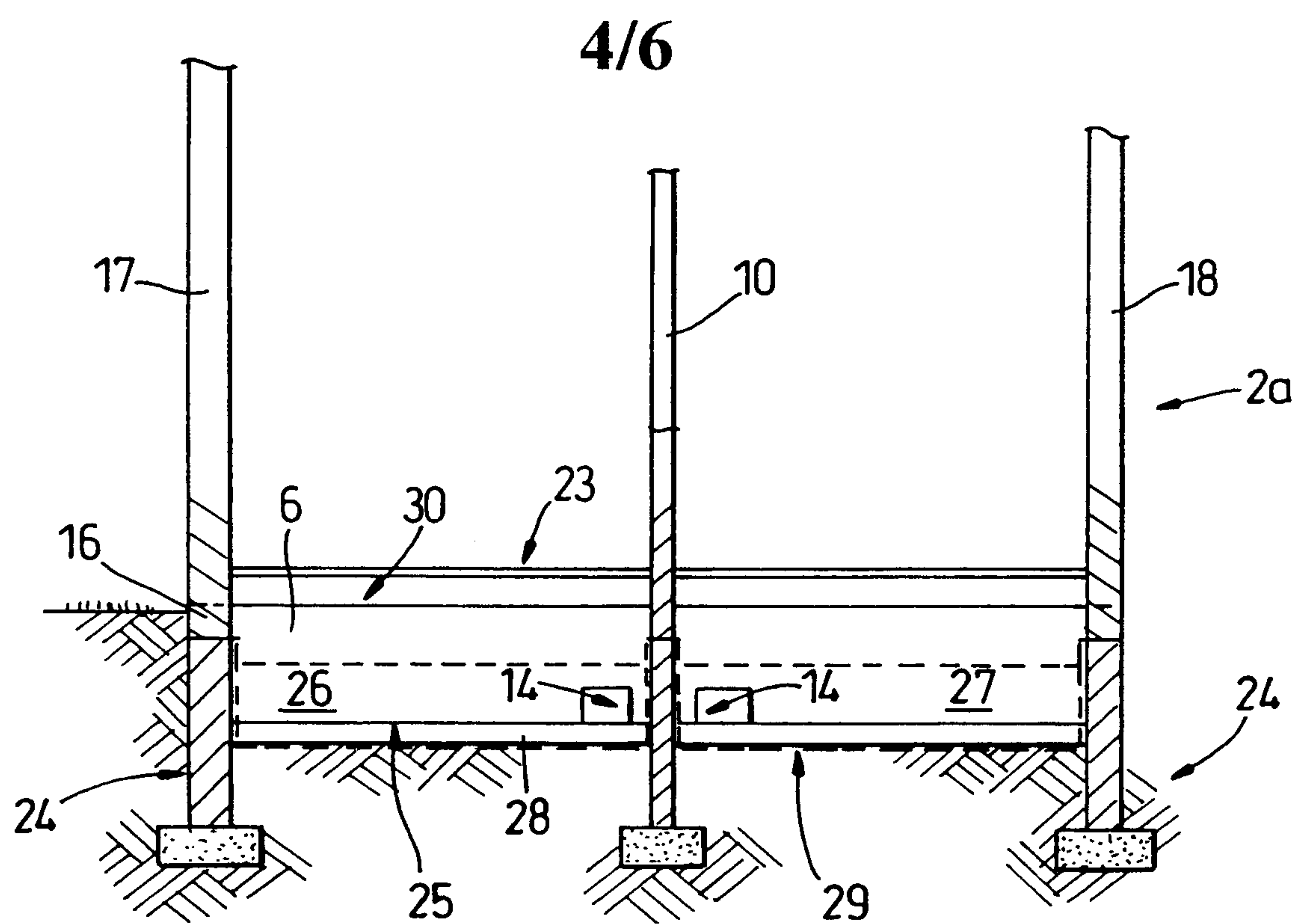


Fig. 4

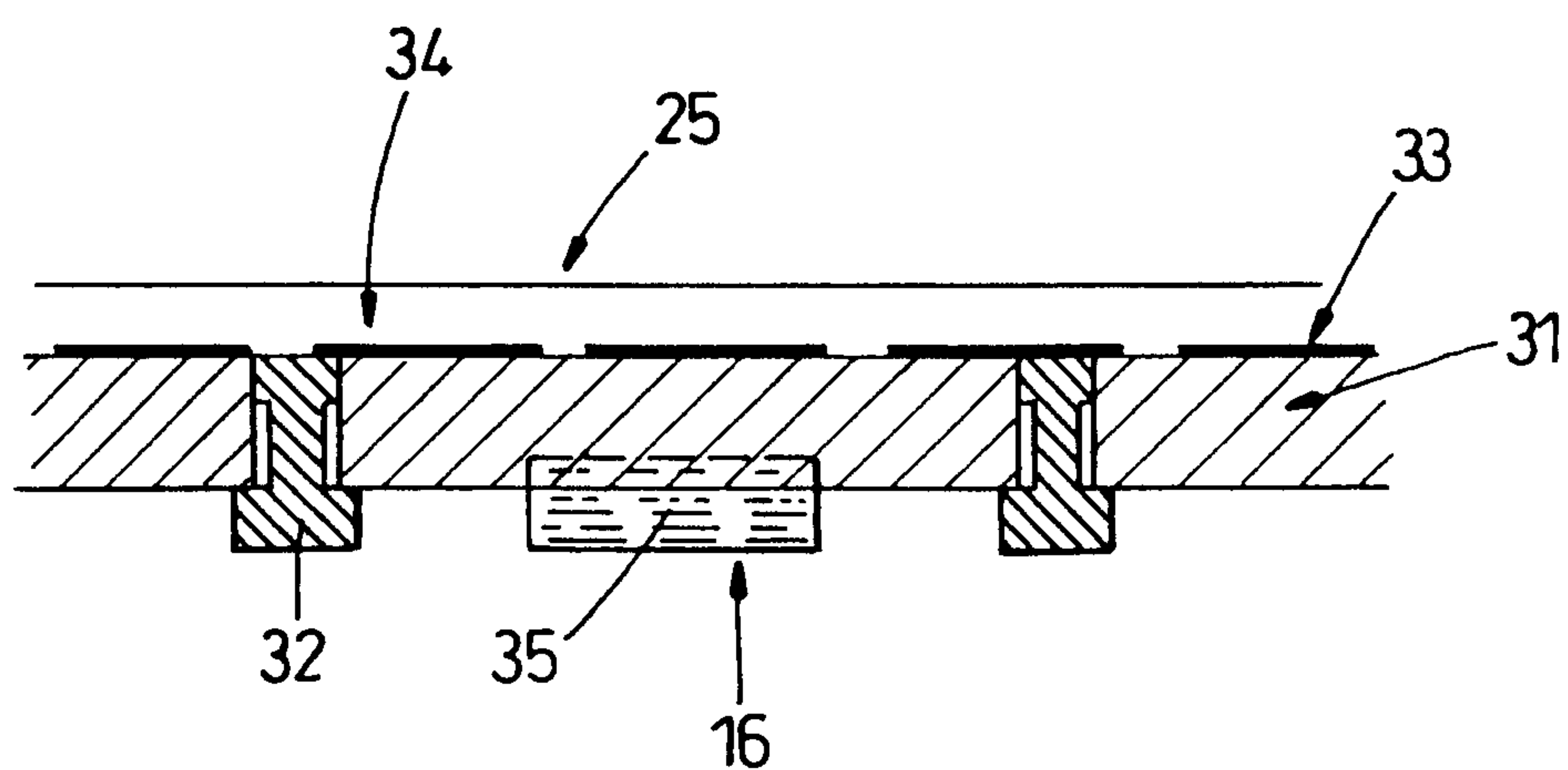


Fig. 5

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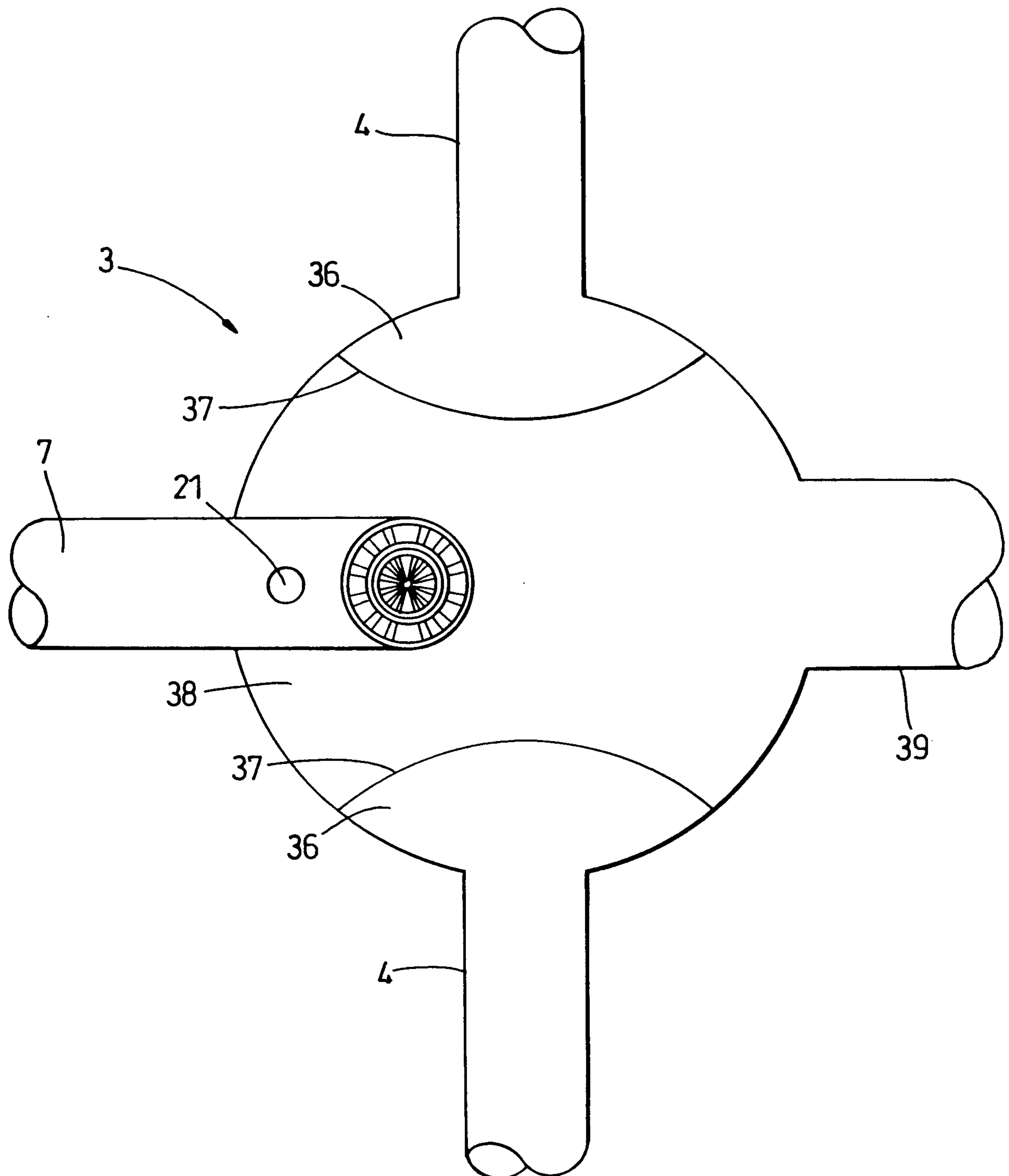
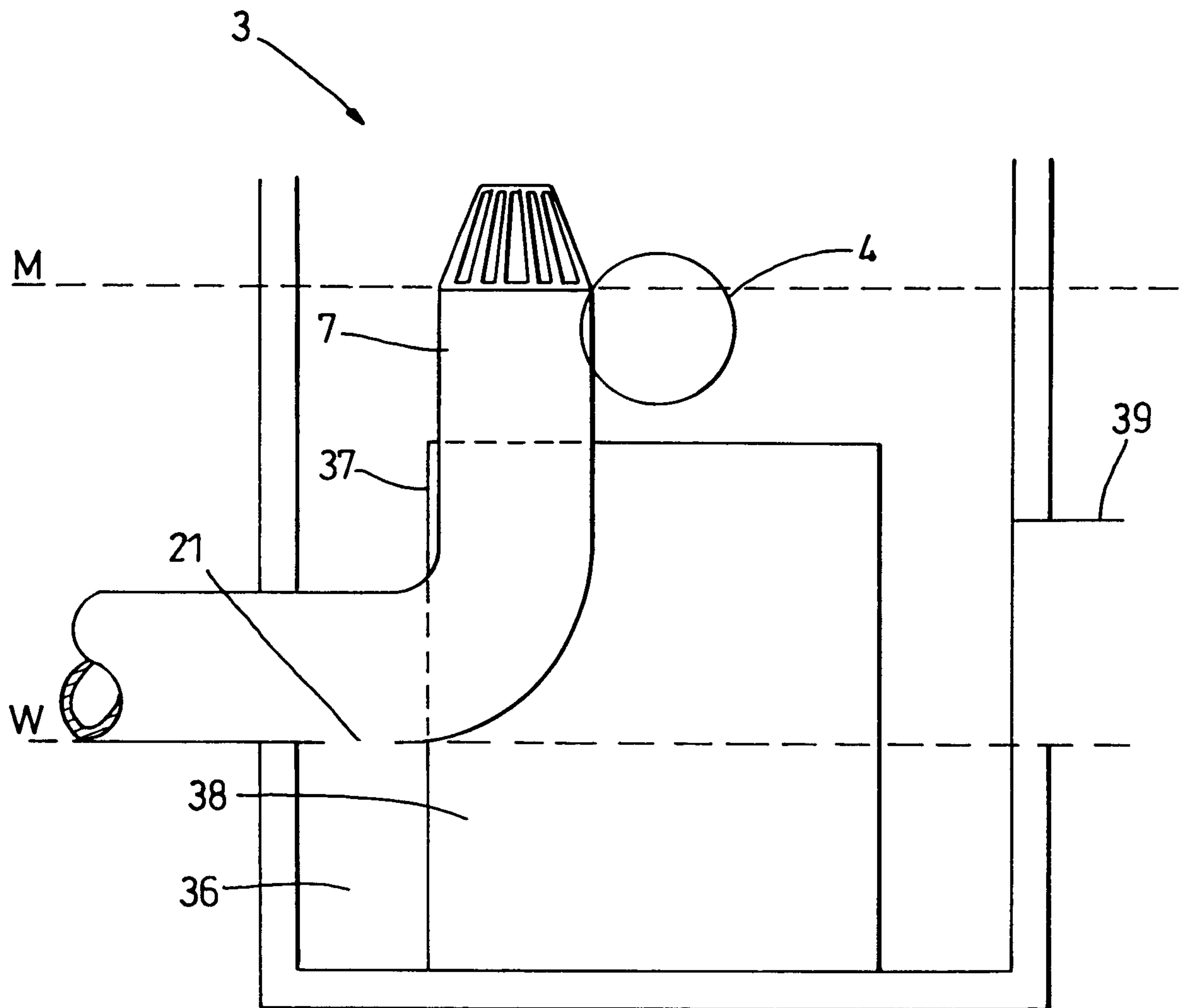


Fig. 6

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*Fig. 7*

