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(54) Title: A NON-RETURN VALVE

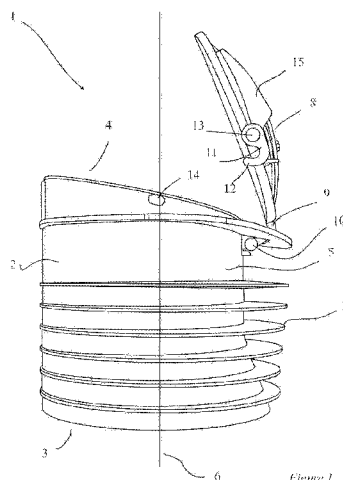


Figure 1

(57) Abstract: A non-return valve (1) comprising • a tubular member (2) for insertion into a pipe, the tubular member comprising an entrance port (3), an exit port (4) and a side wall (5) extending therebetween; • a lid (8) pivotally connected to the tubular member and adapted to pivot about a pivot axis between an open position spaced apart from the exit port and a closed position covering the exit port; • at least one engagement mechanism (14) extending from the side wall proximate to the exit port; • at least one locking arm (11) connected by means of a pivot (13) to the lid, the locking arm being adapted to pivot with respect to the lid about a pivot axis between an unlocked position and a locked position • the locking arm being arranged such that when the lid is closed and the locking arm is in the locked position the locking arm engages the engagement mechanism.



WO 2016/207611 A1

A non-return valve

The present invention relates to a non-return valve. More particularly, but not exclusively, the present invention relates to a non-return valve comprising a tubular member and a lid pivotally connected thereto, the lid having a locking arm pivotally connected thereto, the locking arm being arranged to engage an engagement mechanism when the lid is closed and the locking arm is in a locked position.

Outgoing domestic pipes often drain into a manhole or similar. In times of flood the manhole will fill with water. The water in the manhole may flow under pressure back up the pipe causing flood damage.

Non-return valves are known which can be used to prevent such damage. Generally these require modification of the manhole before they can be installed which can be expensive. Alternatively, the valve can be installed in line with the man hole but this requires the digging of a separate inspection chamber which is also expensive.

EP 2 459910 discloses a non-return valve which can be attached to the end of a domestic pipe at its point of entry into the manhole and which does not require modification of the manhole. The locking mechanism comprises a lid which may be moved into a position covering the exit port of the valve. The lid prevents water from flowing through the non-return valve up the pipe. It also stops foul smells and odours from entering the pipe. The lid can be locked closed for maintenance work by a locking mechanism. The locking mechanism however is complex and unreliable.

The present invention seeks to overcome the problems of the prior art.

Accordingly, the present invention provides a non-return valve comprising

a tubular member for insertion into a pipe, the tubular member comprising an entrance port, an exit port and a side wall extending therebetween;

a lid pivotally connected to the tubular member and adapted to pivot about a pivot axis between an open position spaced apart from the exit port and a closed position covering the exit port;

at least one engagement mechanism extending from the side wall proximate to the exit port;

at least one locking arm connected by means of a pivot to the lid, the locking arm being adapted to be pivoted with respect to the lid about a pivot axis between an unlocked position and a locked position

the locking arm being arranged such that when the lid is closed and the locking arm is in the locked position the locking arm engages the engagement mechanism.

The non-return valve according to the invention comprises a relatively simple and reliable locking mechanism which locks the lid firmly in place.

Preferably the engagement mechanism comprises a protrusion and the locking arm comprises a hook for engagement with the protrusion.

Preferably the non-return valve comprises a plurality of engagement mechanisms spaced apart around the exit port and a plurality of locking arms pivotally attached to the edge of the lid, each locking arm being arranged to engage with a corresponding engagement mechanism.

Preferably the non-return valve comprises first and second engagement mechanisms extending from the side wall on opposite sides of the exit port and first and second corresponding locking arms pivotally attached to the lid.

Preferably a locking plate extends between the locking arms.

Preferably the lid comprises a plurality of protrusions extending therefrom, the locking plate being adapted to be received between the protrusions when the locking arms are in the locked position.

Preferably the pivot axis of the at least one locking arm is parallel to the pivot axis of the lid.

Preferably the diameter of the tubular member increases from the exit port towards the entrance port.

Preferably the non-return valve further comprises a plurality of spaced apart resiliently deformable flanges extending from the side wall.

Preferably the lid is oval.

The present invention will now be described by way of example only and not in any limitative sense with reference to the accompanying drawings in which

Figure 1 shows a non-return valve according to the invention with the lid open;

Figure 2 shows the non-return valve of figure 1 with the lid closed and unlocked; and,

Figure 3 shows the non-return valve of figure 1 with the lid closed and locked.

Shown in figure 1 is a non-return valve 1 according to the invention from the side. The non-return valve 1 comprises a tubular member 2. The tubular member 2 comprises entrance and exit ports 3,4 and a side wall 5 extending therebetween along a long axis 6. In use the tubular member 2 is inserted entrance port first into a pipe (not shown). The entrance port 3 is substantially normal to

the length axis 6 and so is circular. The exit port 4 is inclined to the length axis 6 as shown and so is elliptical in shape.

The diameter of the tubular member 2 decreases from the entrance port 3 to the exit port 4. This has the effect of funnelling water received at the entrance port 3 to the exit port 4. The thickness of the side wall 5 decreases close to the entrance port 3 in a direction towards the entrance port 3. This reduces turbulence created in the water as it enters the non-return valve 1.

A plurality of spaced apart resiliently deformable flanges 7 extends outwardly from the side wall 5. The flanges 7 have a diameter slightly larger than the pipe. As the non-return valve 1 is pushed into the pipe friction between the pipe wall and the flanges 7 deforms the flanges 7 towards the exit port 4. Once deformed the flanges 7 resist removal of the non-return valve 1 from the pipe. The use of such flanges 7 makes the non-return valve 1 suitable for use with pipes of a plurality of different diameters, typically in the range 96mm to 110mm.

The non-return valve 1 further comprises a lid 8. The lid 8 is elliptical in plan view and is slightly domed in side view as shown. Connected to the edge of the lid 8 is a connection arm 9. This is in turn connected to a pivot 10 extending from the side wall 5. The lid 8 can be displaced between open and closed configurations. In the open configuration (as shown in figure 1) the lid 8 is spaced apart from the exit port 4. Water which enters the entrance port 3 is free to flow through the non-return valve 1 and out the exit port 4.

Pivotally connected to the edge of the lid 8 are first and second locking arms 11. As can be best seen in figure 2 the two locking arms 11 are arranged on opposite sides of the lid 8 and share a common pivot axis. Each locking arm 11 comprises a hook 12 the purpose of which is described below. Extending from the side wall 5 of the tubular member 2 adjacent to each locking arm pivot 13 is an engagement mechanism 14. In this embodiment the engagement mechanism 14 is an elliptical protrusion 14. Each locking arm 11 can be pivoted about its associated pivot 13 with respect to the lid 8 between locking and unlocking positions. The locking arm 11 is shown in the unlocking position in figure 1.

Extending between the locking arms 11 is a locking arm bar 15. The locking arm bar 15 is slightly curved as shown so that when the locking arms 11 are in the unlocked position the locking arm bar 15 closely fits against the domed top of the lid 8.

Shown in figure 2 is the non-return valve 1 of figure 1 with the lid 8 pivoted from the open to the closed position. The pivot axis of the lid 8 is parallel to the pivot axis of the locking arms 11. The locking arms 11 are still in the unlocked position remote from the engagement means 14. Preferably the non-return valve 1 is installed in the pipe with the lid pivot 10 uppermost so that the lid 8 is moved in a vertical plane between open and closed positions. When installed in this orientation the lid 8 will naturally drop into the closed position as shown. Because the exit port 4 is inclined to the length axis 6 the weight of the lid 8 will keep the lid 8 urged into abutment with the exit port 4 so forming a seal between the two. Water which enters the entrance port 3 will be able to push the lid 8 open and exit the exit port 4. Water incident on the non-return valve 1 in the opposite direction however pushes the lid 8 into engagement with the exit port 4 so preventing water from flowing from the exit port 4 to the entrance port 3. In this position the lid 8 also prevents foul odours and rats from entering the pipe.

If the non return valve 1 is submerged for a prolonged period then the weight of the lid 8 may not be sufficient to prevent water from seeping around the side of the lid 8 into the tubular member 2. In this case it is preferred to lock the lid 8 closed. It is also preferred to lock the lid 8 closed during maintenance of the manhole. Figure 3 shows the non-return valve 1 with the lid 8 locked closed. Compared to figure 2 the locking arms 11 have been rotated about their pivots 13 with respect to the lid 8 from the unlocked position to the locked position. As the locking arms 11 are rotated the hook 12 on each arm 11 engages with the corresponding protrusion 14 on the side wall 5 so locking the lid 8 closed. Typically the hook 12 is shaped such that as the locking arm 11 rotates to the locking position it is urged against the protrusion 14 firmly pulling the lid 8 closed.

The locking arms 11 are rotated to the locking position by placing one or more fingers under the locking arm bar 15 and lifting it until it is substantially normal to the lid 8 as shown. As the locking arm bar 15 reaches the normal position the edge of the locking arm bar 15 is received in protrusions

16 which extend from the outer domed face of the lid 8. The protrusions 16 maintain the locking arm bar 15 in this position and prevent it from dropping back to its original position so unlocking the lid 8.

In the above embodiment each engagement mechanism 14 is a protrusion 14. In alternative embodiments other forms of engagement mechanism 14 are possible. The engagement mechanism 14 could for example be a slot into which the locking arm 11 is received.

CLAIMS

1. A non-return valve comprising

a tubular member for insertion into a pipe, the tubular member comprising an entrance port, an exit port and a side wall extending therebetween;

a lid pivotally connected to the tubular member and adapted to pivot about a pivot axis between an open position spaced apart from the exit port and a closed position covering the exit port;

at least one engagement mechanism extending from the side wall proximate to the exit port;

at least one locking arm connected by means of a pivot to the lid, the locking arm being adapted to pivot with respect to the lid about a pivot axis between an unlocked position and a locked position

the locking arm being arranged such that when the lid is closed and the locking arm is in the locked position the locking arm engages the engagement mechanism.
2. A non-return valve as claimed in claim 1 wherein the engagement mechanism comprises a protrusion and the locking arm comprises a hook for engagement with the protrusion.
3. A non-return valve as claimed in either of claims 1 or 2 comprising a plurality of engagement mechanisms spaced apart around the exit port and a plurality of locking arms pivotally attached to the edge of the lid, each locking arm being arranged to engage with a corresponding engagement mechanism.
4. A non-return valve as claimed in claim 3 comprising first and second engagement mechanisms extending from the side wall on opposite sides of the exit port and first and second corresponding locking arms pivotally attached to the lid.

5. A non-return valve as claimed in claim 4, wherein a locking plate extends between the locking arms.
6. A non-return valve as claimed in claim 5, wherein the lid comprises a plurality of protrusions extending therefrom, the locking plate being adapted to be received between the protrusions when the locking arms are in the locked position.
7. A non-return valve as claimed in any one of claims 1 to 6, wherein the pivot axis of the at least one locking arm is parallel to the pivot axis of the lid.
8. A non-return valve as claimed in any one of claims 1 to 7, wherein the diameter of the tubular member increases from the exit port towards the entrance port.
9. A non-return valve as claimed in any one of claims 1 to 8, further comprising a plurality of spaced apart resiliently deformable flanges extending from the side wall.
10. A non-return valve as claimed in any one of claims 1 to 9 wherein the lid is oval.
11. A non-return valve substantially as hereinbefore described.

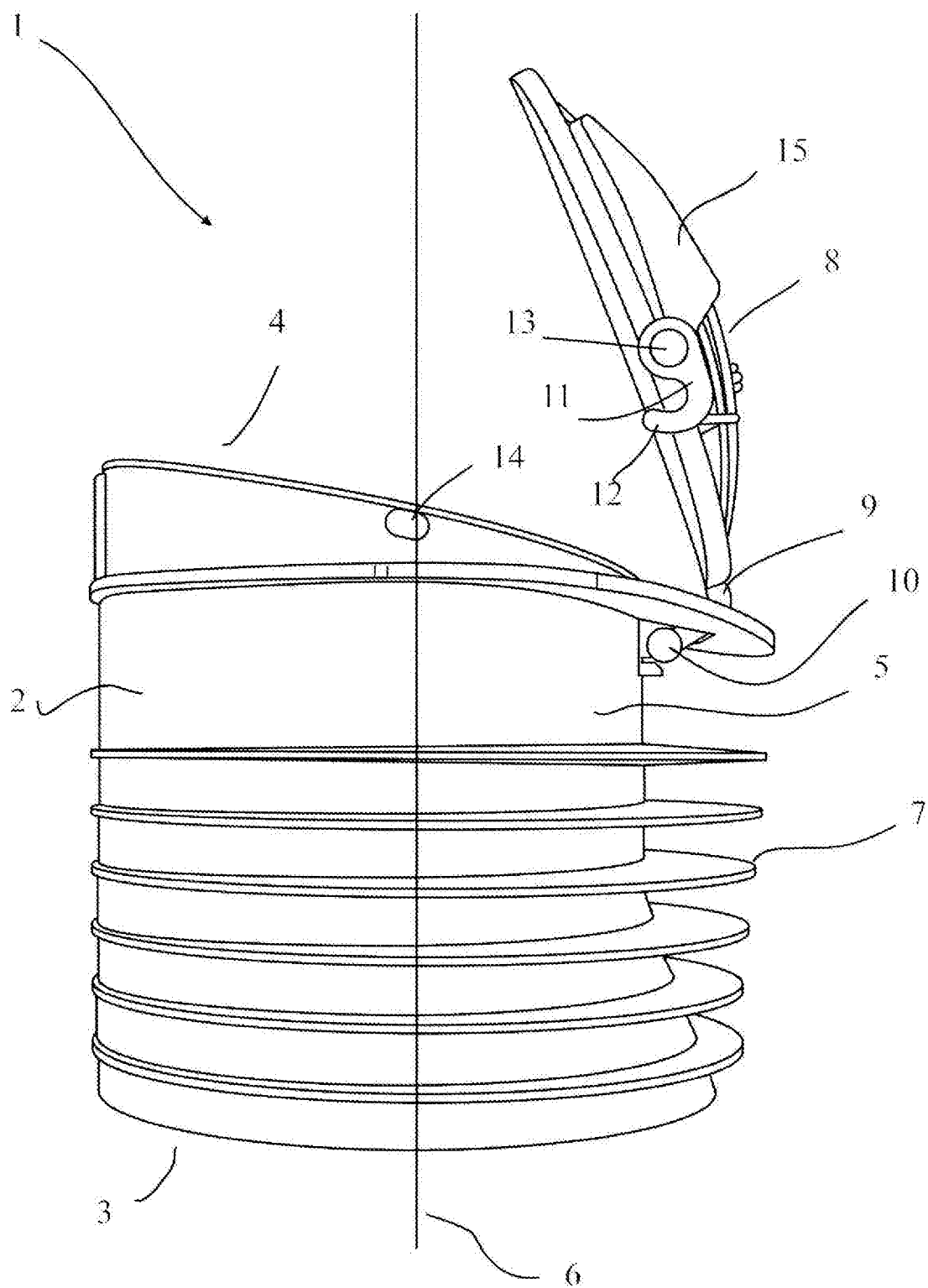
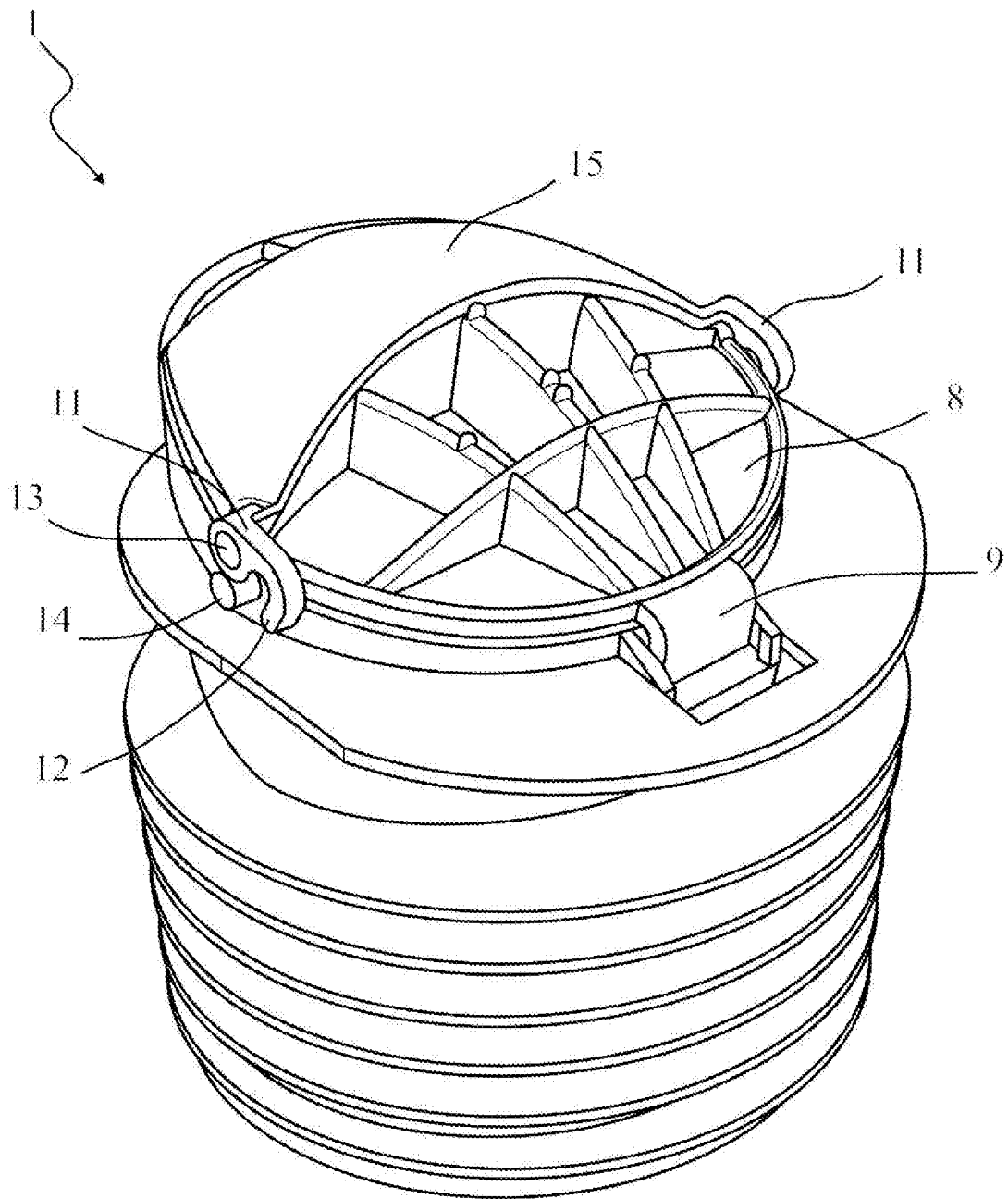
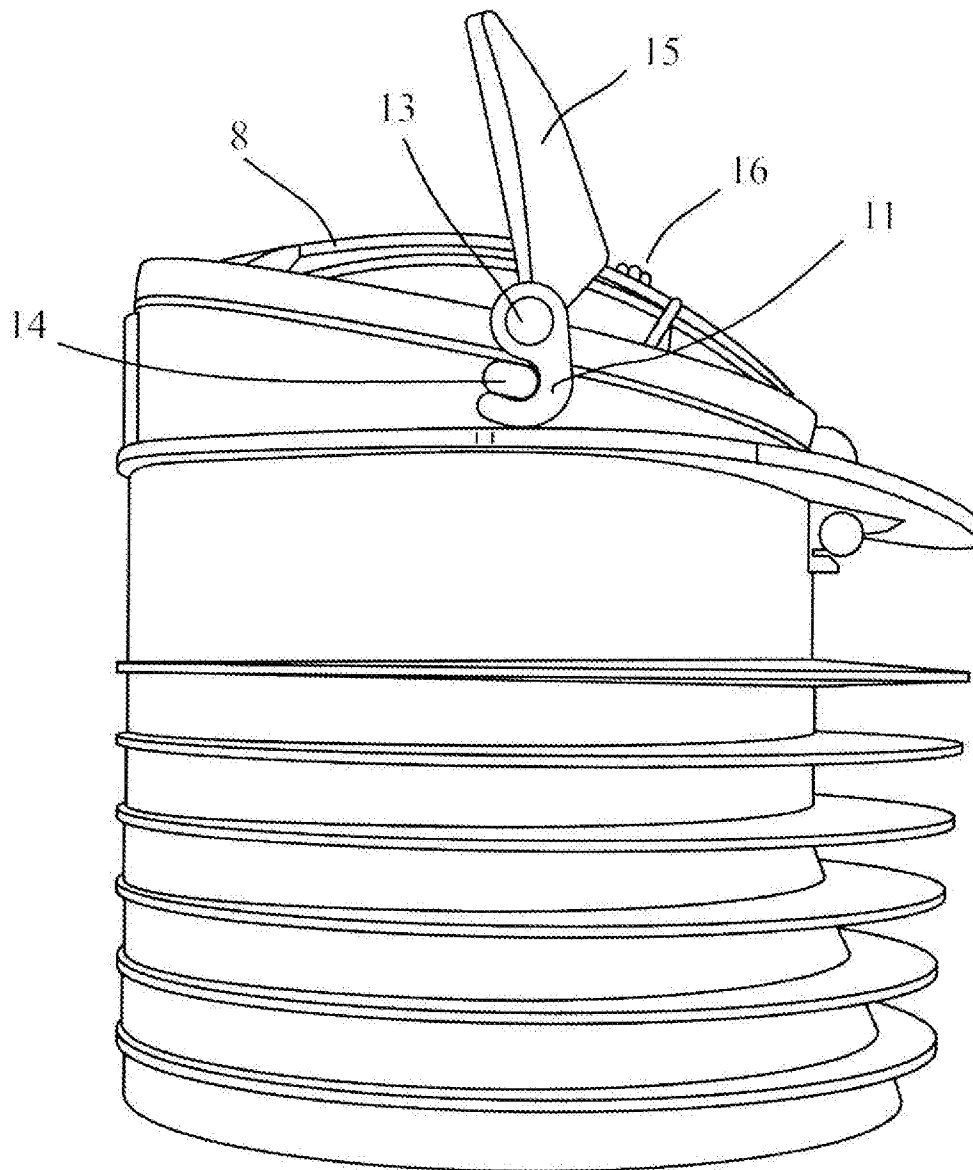


Figure 1

*Figure 2*

3/3

*Figure 3*

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2016/051800

A. CLASSIFICATION OF SUBJECT MATTER

INV. F16K15/03 F16K27/02 E03F7/04
ADD.

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)

F16K E03F

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)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 1 367 911 A (KOPLIN CHARLES C) 8 February 1921 (1921-02-08) page 1, line 34 - line 92; figures -----	1-11
X	GB 325 892 A (AUTOMATIC SPRINKLER CO) 3 March 1930 (1930-03-03) page 1, line 63 - page 2, line 64; figures -----	1-11



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2016/051800

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 1367911	A	08-02-1921	NONE	

GB 325892	A	03-03-1930	NONE	
