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(54) **Self-cleaning floor drain**

(57) There is described a water trap for use in a floor drain in the shape of a vertical pipe (38). The water trap is designed with an outer, upwards open bowl (1) with a bottom and an inner pipe (2) mounted therein which together with the bowl (1) form a water trap. The inner pipe (2) is disposed with a lower edge spaced apart from the bottom of the bowl and with an upper edge located at a position above the upper edge of the bowl (1). The water

trap is provided with an outer cylindric bushing (33) adapted for disposition in the vertical pipe, and the outer side of the lower edge area (36) of the bushing (33) has a conical shape.

Hereby is achieved a water trap which has optimal through-flow and thereby a particularly efficient self-cleaning action that reduces the need for cleaning or makes it completely superfluous.

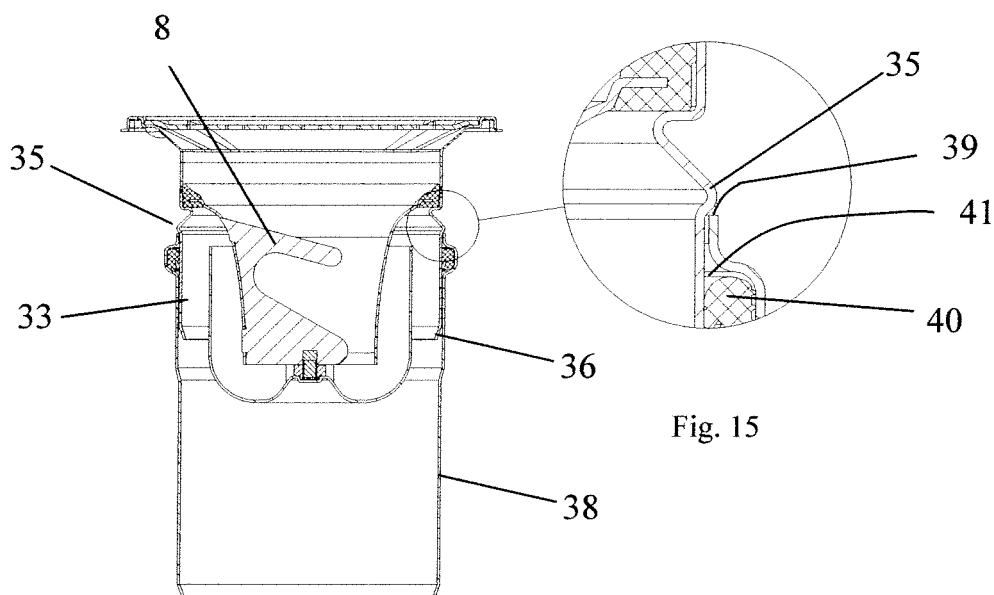


Fig. 14

Fig. 15

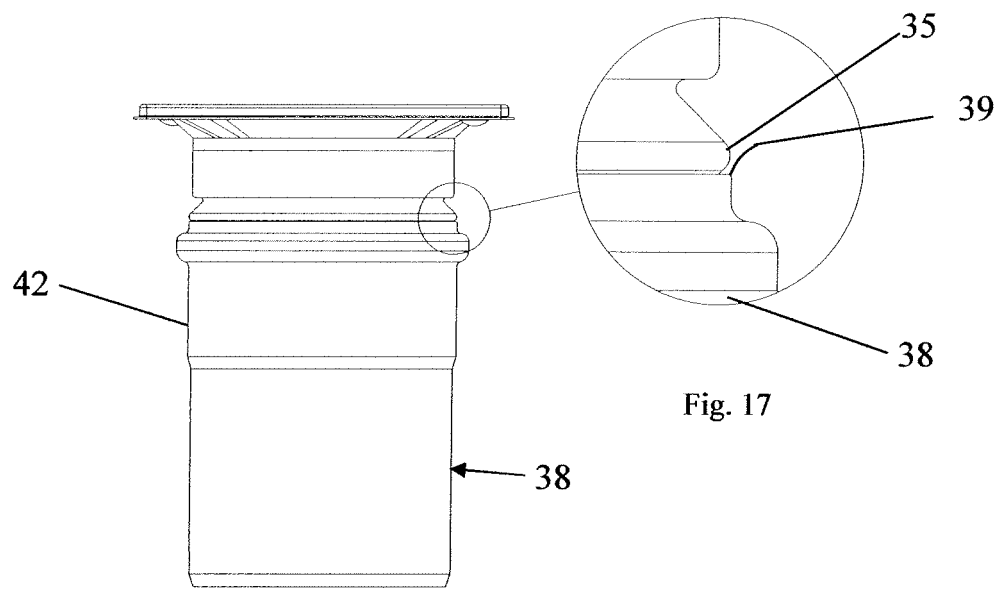


Fig. 16

Fig. 17

Description

Field of the Invention

[0001] The present invention concerns a water trap with ejector for use in a floor drain in the shape of a vertical pipe. More specifically, the invention concerns a water trap of the type with an outer, upwards open bowl with a bottom and an inner pipe mounted therein, which together with the bowl forms a water trap, as the inner pipe is disposed with a lower edge spaced apart from the bottom of the bowl and with an upper edge disposed at a position above the upper edge of the bowl, the water trap being provided with an outer cylindric bushing adapted for disposition in the vertical pipe, and where the outer side of the lower edge area of the bushing has conical shape.

Background of the Invention

[0002] It has been known for many years to place a water trap in a floor drain in e.g. a bathroom. Obnoxious smell from drain pipe and sewer is hereby avoided, as there always will exist a water surface in the floor drain.

[0003] However, the water trap in the floor drain will be connected with drawbacks as it may prevent a rapid and efficient flow through the drain and also give rise to clogging, which may contribute to further reducing the flow through the drain.

[0004] In recent years, stricter official requirements have been made to the water flow, and therefore there is an increased demand for efficient self-cleaning of the drains in order to meet the official requirements without necessitating frequent cleaning. As an example, it is to be mentioned that a drain with diameter 110 mm outlet is to yield 1.4 l/s according to standard EN1253.

[0005] Therefore, it has been desired to enable increasing the flow and thereby reducing the risk of sedimentation in the water trap.

Object of the Invention

[0006] It is the object of the present invention to indicate a water trap of the type specified in the introduction which is adapted for attaining optimal through-flow, thereby having a particularly efficient self-cleaning action in order to reduce the need for cleaning or making it completely superfluous.

Description of the Invention

[0007] According to the present invention, this is achieved by a water trap with ejector of the type mentioned in the introduction, which is peculiar in that the bushing is thin-walled, that it is the lower part of the wall of the bushing which has conical shape and that the conical end of the bushing is disposed opposite a middle section of the height of the bowl.

[0008] The conical shape of the edge area establishes

an ejector action. The flow through the water trap is hereby increased such that a self-cleaning effect occurs, as contaminants are flushed out through the water trap.

[0009] The thin-walled structure will save material. Wall thickness for the bushing for a diameter 110 mm pipe is 1.25 mm. The present invention is suited for application in drains with such dimension, but it may also be applied in other drains with outlets up to diameter 200 mm, or even larger.

[0010] The conical end of the bushing is disposed opposite a middle section of the height of the bowl. Hereby is achieved a reduction of the area between the bushing and the bowl. This imparts a speed increase to the liquid whereby the contaminants are flushed out.

[0011] In a particular embodiment, the conical part is disposed one quarter from the bottom of the bowl. Hereby is achieved an efficient ejector action in an embodiment, wherein the vertical pipe is diameter 110 mm and the height of the water trap is 90 - 100 mm, and where the level of the lower edge of the conical part is 25 - 27 mm from the bottom of the water trap.

[0012] According to a further embodiment, the water trap with ejector according to the invention is peculiar in that the upper edge of the inner pipe has a flange which sealingly engages a collar on the bushing, as sealing means is provided there between. This may facilitate direct mounting of the water trap in a drain pipe.

[0013] According to a further embodiment, the water trap with ejector according to the invention is peculiar in that at its upper end, the bushing is provided with an external bead for abutting on an end edge of a drain pipe. In that the bushing is adapted for mounting in the drain pipe, a particularly simple construction is achieved with simple mounting, as the bushing functions as an adaptor where the bead ensures that a packing on drain pipe will be correctly positioned in relation to the bushing/water trap.

[0014] According to a further embodiment, the water trap with ejector according to the invention is peculiar in that the bushing has an outer diameter of 110 mm in order to fit into a standard drain pipe. Thus it becomes possible to mount a water trap directly into a vertical drain pipe. For a bushing fitting in such a pipe, the height of the conical edge area will typically be between 3 and 10 mm, and particularly between 4 and 6 mm.

[0015] According to a further embodiment, the water trap with ejector according to the invention is peculiar in that the bowl has a rectangular cross-section. The inner pipe may be conical and have circular cross-section. In practice it has appeared that a very efficient flow through the water trap is attained when the inner pipe is circular and the bowl is rectangular. A whirling movement that may be formed in the inner pipe will thus be broken, and a laminar flow advantageously appears at the corners in the gap between the inner side of the bowl and the outer side of the inner pipe. This destroys the whirling and increases the flow, contributing to reduce the risk of sedimentation. At the same time, a self-cleaning effect is en-

hanced in that the flow produces a kind of flushing action entraining hair, threads, sludge and other contaminants through the drain. In practice it has surprisingly appeared possible to achieve a flow that is almost doubled in relation to the flow through a corresponding size of drain with circular bowl. A corresponding action with laminar flow is also achieved between the outer side of the bowl and the inner side of the bushing. It has appeared that this laminar flow supports the ejector action which is produced by the bushing and that a particularly efficient flow is achieved thereby.

[0016] According to a further embodiment, the water trap with ejector according to the invention is peculiar in that the lower edge area and a central axis through the water trap form an angle which is between 10° and 30°, preferably about 15°. This provides a good ejector action.

[0017] According to a further embodiment, the water trap with ejector according to the invention is peculiar in that bushing has an upper edge extending up over the top part of the inner pipe. The bushing may hereby be used for delimiting the drain towards the adjacent floor and packings between the inner pipe, and the bushing will be protected so there is no risk of leaks in the drain. Thus there is no risk that water runs down on the outer side of the bowl or that a smell rises from drain pipe.

[0018] The invention may advantageously be combined with one or more of the following inventions for which independent patent applications have been filed with the following main claims:

[0019] A water trap for use in a floor drain and with an outer, upwards open bowl with a bottom and an inner pipe mounted therein, which together with the bowl forms a water trap, as the inner pipe is disposed with a lower edge spaced apart from the bottom of the bowl and with an upper edge disposed at a position above the upper edge of the bowl, the water trap including a handle in an upper part of the inner pipe for taking up the water trap and/or for use in separating the inner pipe and the bowl with the object of cleaning, and where the handle has an extent across part of the diameter of the inner pipe and runs from the inner side of the inner pipe and obliquely downwards against a central part of the inner pipe.

[0020] A strainer for a water trap for use in a floor drain and with an outer, upwards open bowl with a bottom and an inner pipe mounted therein, which together with the bowl forms a water trap, as the inner pipe is disposed with a lower edge spaced apart from the bottom of the bowl and with an upper edge disposed at a position above the upper edge of the bowl, the water trap including a handle in an upper part of the inner pipe for taking up the water trap and/or for use in separating the inner pipe and the bowl with the object of cleaning, where the strainer has a downwards convex shape adapted to fit in the upper part of the inner pipe, where the rim of the strainer is adapted to rest against the upper edge of the inner pipe, where the central part of the strainer is adapted to rest against part of the top side of the handle, and where a central handle is provided in the convex interior of the

strainer, extending to a level at the rim of the strainer.

Description of the Drawing

[0021] The invention will then be explained in more detail with reference to the accompanying drawing, where:

- Fig. 1 shows a view of a water trap, as seen from below, in a floor drain;
- Fig. 2 shows a sectional view from the side through a water trap with a bowl according to Fig. 1 in which an inner pipe is mounted;
- Fig. 3 shows a side view of the water trap shown in Fig. 2;
- Fig. 4 shows a view of the water trap shown in Figs. 2 and 3, as seen from above;
- Fig. 5 shows a perspective view, partly in section, of the water trap shown in Figs. 2-4;
- Fig. 6 shows a side view of strainer for use in the water trap;
- Fig. 7 shows a view from above of a strainer for use in the water trap;
- Fig. 8 shows a sectional view corresponding to Fig. 2 with the strainer mounted in the water trap;
- Fig. 9 shows a perspective view corresponding to Fig. 5 with the strainer mounted in the water trap;
- Fig. 10 shows a sectional view corresponding to Fig. 2 with the water trap mounted in a bushing;
- Fig. 11 shows a side view of the water trap mounted in the bushing;
- Fig. 12 shows a view from above of the water trap mounted in the bushing;
- Fig. 13 shows a perspective view of the water trap mounted in the bushing;
- Fig. 14 shows a sectional view corresponding to Fig. 10 for illustrating the water trap mounted in a floor drain;
- Fig. 15 shows a partial view of a detail of the floor drain shown in Fig. 14;
- Fig. 16 shows a side view of the floor drain shown in Fig. 14; and
- Fig. 17 shows a partial view of the floor drain shown in Fig. 16.

Detailed Description of the Invention

[0022] In the Figures, corresponding or identical elements are provided with the same reference numbers, and no detailed explanation of such details in connection with each individual figure will necessarily be given.

[0023] In fig. 1, the water trap is seen from below. It appears that a bowl 1 has a largely rectangular cross-section. In the bowl 1 is fitted an inner pipe 2 (see Fig. 2) which has an outer edge 3 with a larger diameter than the outermost extent of the bowl. The edge 3 is provided with a packing 4 (see Fig. 2).

[0024] As seen from Fig. 2, the inner pipe 2 is trumpet-shaped and has a circular cross-section running inside the bowl 1. Inside the bowl, channels 5 are formed hereby which are particularly distinct in the areas where there is the greatest distance between the inner pipe 2 and the side edges 6 of the bowl 1. A plate element 7 is mounted inside the inner pipe 2. At the upper side, the plate element 7 is provided with a handle part 8 with a top side 9. The plate element 7 is provided with projections 10 adapted to be mounted in cutouts 11 in the sidewall of the inner pipe. Moreover, a threaded branch 12A engaging a threaded bushing 12B, which is fastened to the bottom of the bowl 1, is mounted in the plate element 7.

[0025] In Fig. 3 is seen the projection 10 extending out through a cutout 11 in the inner pipe 2 which is mounted in the bowl 1.

[0026] Figs. 2 and 3 illustrate a water trap such as used with a bowl 1 which is open upwards via the opening 13. Through this upper opening 13, the inner pipe 2 is mounted. Also, the inner pipe 2 has an upwards directed opening 14 where water penetrates into the water trap/floor drain.

[0027] Fig. 4 shows a view seen from above. Here it is seen that the handle 8 is directed largely diagonally and extends from the sidewall of the inner pipe and about 80% above the diameter of the inner pipe in the position where the handle is situated.

[0028] As it particularly appears from Fig. 2, the handle 8 is located in an area corresponding to the level for the upper edge 15 of the bowl 1. The upper edge 15 defines the level of the water surface in the water trap. As the handle 8 is located at this level for the water surface, whirl formation will be prevented when water flows in through the opening 14 in the water drain. Hereby, the flow through the water trap is optimised.

[0029] As seen in Fig. 5, the plate element 7 is largely U-shaped, which also appears in Fig. 2. In the central part 16 of the plate element 7 there is thus a free cutout. Alternatively, it may be designed as a plate member extending the whole way from the foremost end 16 of the handle 8 and down to the foremost end 18 of the lower part 19 of the handle on which the threaded connection 12A is fitted.

[0030] Fig. 6 shows a side view of a strainer 20. The strainer has a bottom 21 which is provided with a number of openings 22. The bottom 21 of the strainer is formed with three conical sections, of which a first section 23, which is an outer ring area, is relatively steep, and a second section 24 in an intermediate area which is less steep, and a section 25 in a central area having a slight inclination. The inclination is indicated in relation to a horizontal orientation.

[0031] The strainer is provided with a handle 26 consisting of a stem 27 and an upper grip knob 28. As seen in Fig. 6, the grip knob is provided such that it only extends immediately above the upper rim of the strainer 29 which is designed with a convex shape. The convex shape of the strainer provides that it may be disposed in the inner

pipe as it appears in Fig. 8 in such a way that it does not contribute to the installation height for the water trap.

[0032] At an upper rim 30, the strainer has a packing 31 serving for sealing abutment against the upper edge 3 of the inner pipe 2. In practice, the abutment occurs by abutting against the packing 4. As it appears from Fig. 8, the strainer is adapted such that the underside of the convex strainer rests with its underside against the top side 9 of the handle 8. It is seen that the strainer rests with a great length, namely the entire section 24, on the top side of the handle 8. Moreover, it appears that the very steep section 23 provides that the greater part of the strainer can rest on the top side 9. Hereby, the risk of catching hair, threads and similar that may penetrate through the strainer is avoided. Moreover, the oblique orientation of the top side 9 of the handle 8 will cause possible hairs and threads being caught on the free top side of the handle will be flushed away and carried through the water trap such that this is not clogged.

[0033] One of the channels 5 formed in an area with a corner 32 of the outer bowl 1 is seen particularly clearly in Fig. 9. In this area, water flowing through the interior of the inner pipe will penetrate up and leave the water trap above the upper edge 15 on the bowl 1. A laminar flow in the channels 5 will be imparted by the water flow through the water trap. The risk of circle formation is thus broken, not only by the handle 8, but also due to the shape of the outer bowl for establishing the channels. This increases the flow in the water trap.

[0034] Fig. 10 illustrates the above mentioned water trap mounted in a cylindric bushing 33. At its top side, the bushing has a collar 34 where the upper edge of the inner pipe 2 with the packing 4 is in sealing engagement. Furthermore, it appears that the bushing 33 is provided with an outwards directed bead 35 at a position immediately under the collar 34. As seen also by Fig. 11, the outer side of the lower edge area 36 of the bushing has conical shape. As it particularly appears from Fig. 10, the bushing 33 is thin-walled, such that the conical shape has been provided by the wall itself being imparted the conical shape in the lower edge area 36.

[0035] As it particularly appears from Fig. 12, channels 37 are provided between the bushing 33 and the outer side of the bowl 1, the channels 37 substantially having the same function as the channels 5. The flow of liquid flowing above the upper edge 15 on the bowl 1 will flow down through the channels 37 and will continuously maintain a laminar flow preventing whirl formation. It will thus also contribute to a large flow through the water trap. The flow will contribute to a self-cleaning effect.

[0036] Fig. 13 shows in perspective a view of the water trap mounted in the bushing 33 with the upwards directed, open water lock which is brought into sealing abutment against the bushing 33 due to the sealing engagement of the packing 4 with the inner side of the bushing.

[0037] Fig. 14 shows how the bushing 33 with the water trap mounted therein, as illustrated in Figs. 10-13, is mounted in a floor drain in the shape of a vertical pipe.

By a vertical pipe is meant a pipe mounted in a building construction with vertical orientation when in use.

[0038] It appears from Fig. 14 and particularly clearly from Fig. 15 that the bead 35 serves as abutment against an upper edge 39 on the vertical pipe 38. Hereby it is ensured that a packing 40 provided in a recess 41 in the vertical pipe 38 will always be correctly placed on the cylindric part of the bushing 33.

[0039] In Figs. 16 and 17 is also seen how the bead 35 is bearing against the edge 39 on the pipe 38. The pipe 38 is provided in the shown form as a socket pipe with a socket 42 serving to receive the bushing 33. As seen in Fig. 14, the bushing 33 is disposed at a lesser distance than the length of the socket 42 such that there is a free length from the lower edge area 36 of the bushing 33.

[0040] As shown in Fig. 14, the lower edge area 36 will have conical shape directed into the vertical pipe 38. Hereby, an ejector action is produced, contributing to increase the flow through the water trap and the vertical pipe 38. The floor drain illustrated in Figs. 14-17 will thus have an ejector action. This ejector action enhances the flow through the floor drain.

[0041] The increased flow in the floor drain is thus achieved due to a combined action from the handle 8, the channels 5 and 37 and the edge area 36.

[0042] The floor drain will thus be largely self-cleaning without risk of sedimentation of sludge and the like, and without risk of deposition of hair or threads on the handle 8.

[0043] During use, the handle 8 may serve to lift the entire water trap up from the floor drain with the object of cleaning. Moreover, the handle part may be applied for separating the inner pipe 2 from the bowl 1 as the handle may be used for separating the screw connection 12A, 12B.

[0044] Water running through the drain will always run through the inner pipe due to the use of the packings, and is discharged through the vertical pipe 38 in a secure way.

[0045] The water will thus flow through the water trap from the top side of the inner pipe and down through the inner pipe and under the lower edge of the inner pipe which is disposed at a distance from the bottom of the bowl. It will then flow up along the outer side of the inner pipe in the interspace between the inner pipe and the bowl and flow out over the upper edge of the bowl which at the same time defines the level of the water in the water trap. From the bowl, the water will flow down through the bushing and onwards down into the vertical pipe.

Claims

1. A water trap with ejector for use in a floor drain in the form of a vertical pipe (38) and with an outer, upwards open (1) bowl with a bottom and an inner

pipe (2) mounted therein, which together with the bowl (1) forms a water trap, as the inner pipe (2) is disposed with a lower edge spaced apart from the bottom of the bowl and with an upper edge disposed at a position above the upper edge of the bowl, the water trap being provided with an outer cylindric bushing (33) which is adapted for disposition in the vertical pipe (38), and where the outer side of the lower edge area (36) of the bushing has conical shape, **characterised in that** the bushing (33) is thin-walled, that it is the lower part of the wall of the bushing which has conical shape and that the conical end (36) of the bushing is disposed opposite a middle section of the height of the bowl.

2. Water trap with ejector according to claim 1, **characterised in that** the conical end (36) is disposed one quarter from the bottom of the bowl (1).

3. Water trap with ejector according to claim 1, **characterised in that** the height of the water trap is 90 - 100 mm, and that the level of the lower edge of the conical part (36) is 25 - 27 mm from the bottom of the water trap.

4. Water trap with ejector according to any preceding claim, **characterised in that** the upper edge of the inner pipe has a flange which sealingly engage a collar (34) on the bushing (33), as a sealing means (4) is provided there between.

5. Water trap with ejector according to any preceding claim, **characterised in that** at its upper end, the bushing (33) is provided with an external bead (35) for abutting on an end edge (39) of a drain pipe.

6. Water trap with ejector according to any preceding claim, **characterised in that** the bushing (33) has an outer diameter of 110 mm in order to fit into a standard drain pipe.

7. Water trap with ejector according to any preceding claim, **characterised in that** the bowl (1) is provided with a rectangular cross-section.

8. Water trap with ejector according to claim 6, **characterised in that** the inner pipe (2) is conical and has a circular cross-section.

9. Water trap with ejector according to any preceding claim, **characterised in that** the lower edge area and a central axis through the water trap form an angle which is between 10° and 30°, preferably about 15°.

10. Water trap with ejector according to any preceding claim, **characterised in that** the bushing (33) has an upper edge extending up above the upper part of

the inner pipe (2).

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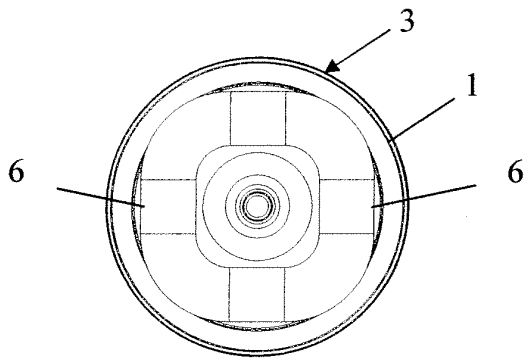


Fig. 1

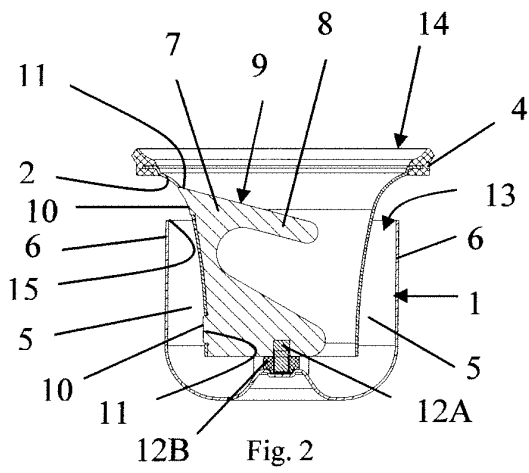


Fig. 2

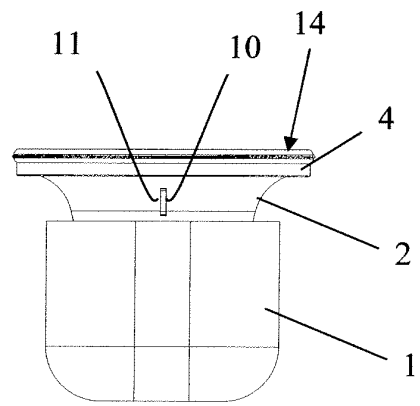


Fig. 3

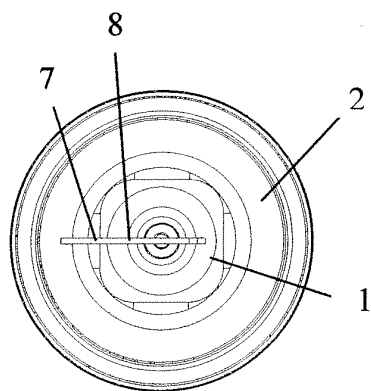


Fig. 4

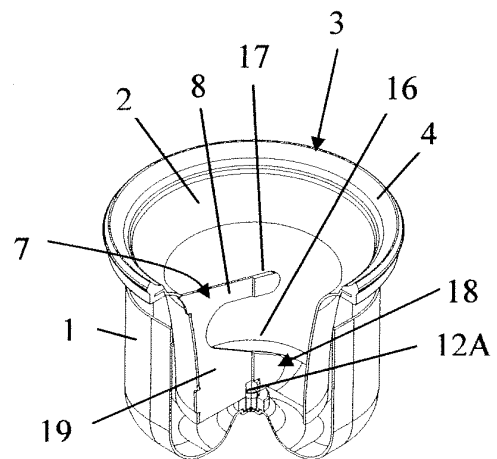


Fig. 5

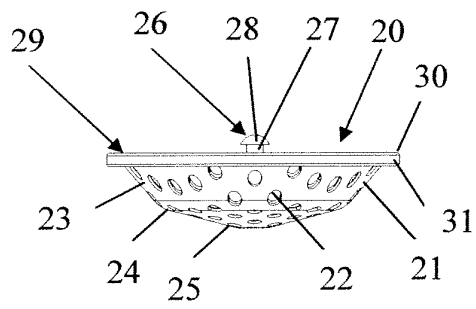


Fig. 6

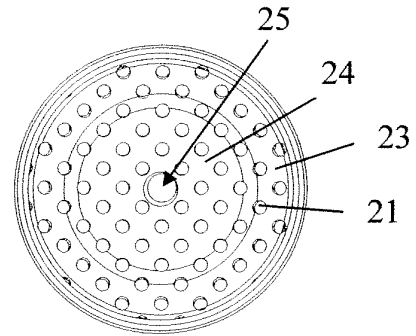


Fig. 7

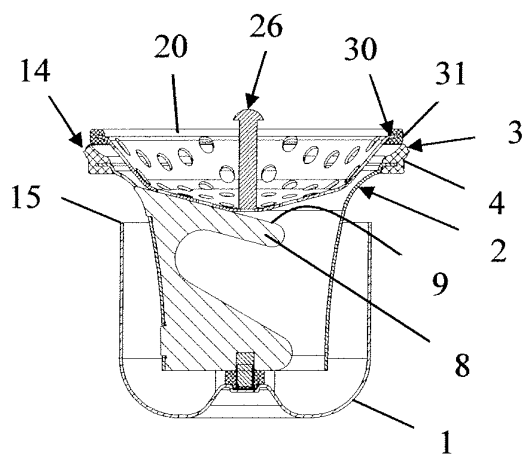


Fig. 8

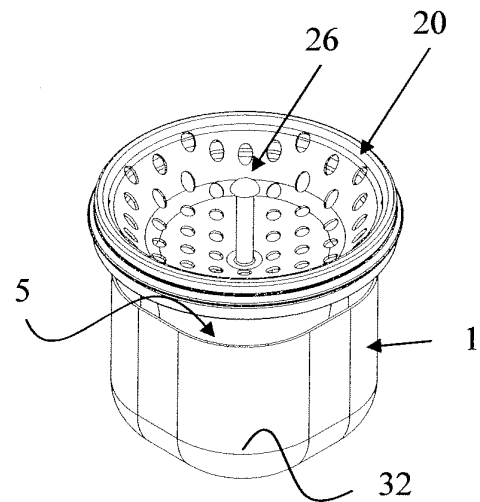


Fig. 9

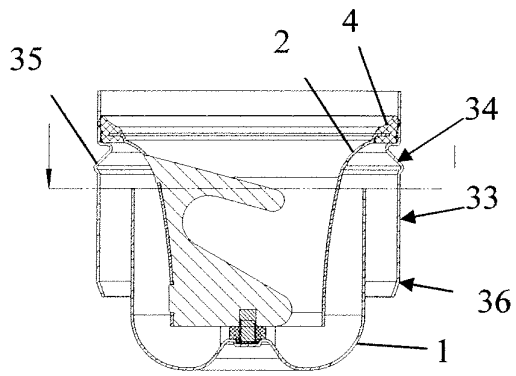


Fig. 10

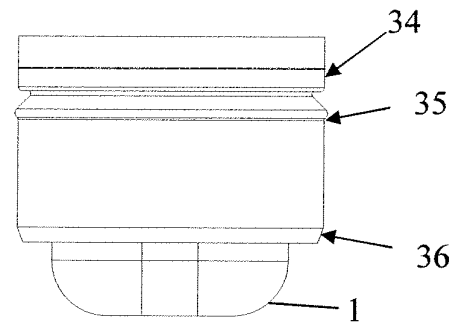


Fig. 11

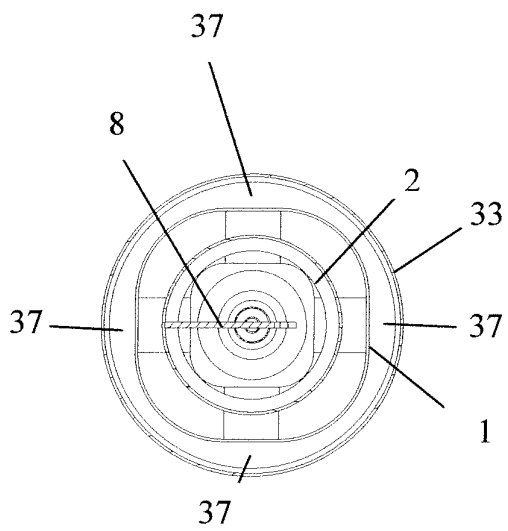


Fig. 12

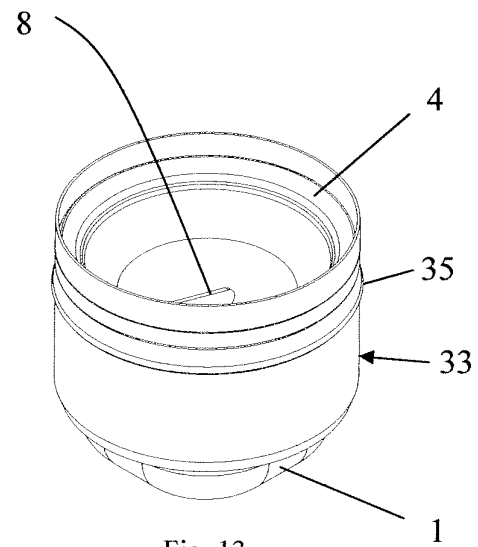


Fig. 13

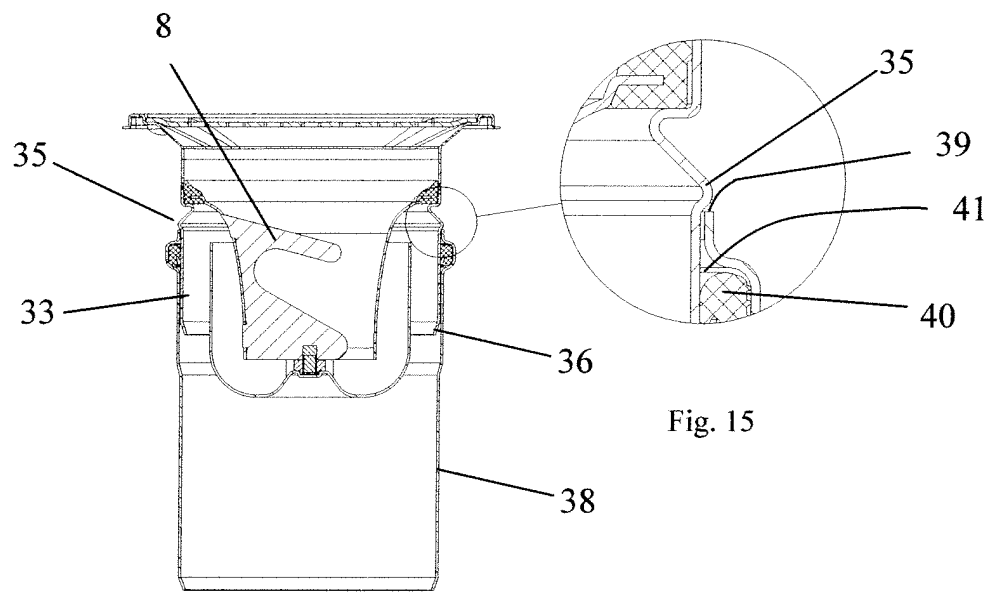


Fig. 14

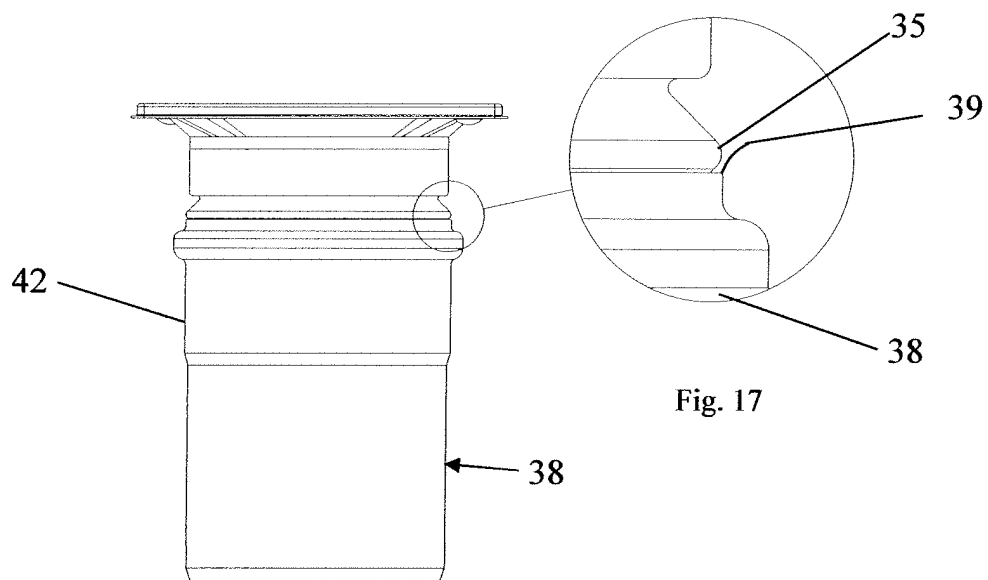


Fig. 16