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(54) Inspection pit

(57) Inspection pit comprising a bottom and a circumferential wall, wherein the circumferential wall is provided with at least one upstream and one downstream passageway for receipt and discharge, respectively, of waste water and the bottom is provided with a channel for passage of the waste water from the upstream passageway to the downstream passageway, wherein both passageways are adapted for connection to a supply pipe and a discharge pipe, respectively, wherein the channel and the passageways form passages having flow cross-sections and the inspection pit at the location of the interconnection between at least two of the passages is provided with an accommodation space for a transition piece for if necessary defining a flow transition between those two passages.

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Description

[0001] The invention relates to inspection pits.

[0002] An inspection pit is a vertical aid in a sewage line for waste water or precipitation. The inspection pit is usually accessible via the street, where it is covered by a lid. One or several influent lines and usually one effluent line lead into an inspection pit. The inspection pit can be used for transition between the influent and effluent lines whether or not the diameters of those lines are different from each other. The inspection pit can furthermore be used for changing the direction between the influent and effluent lines. Most of all, the inspection pit is intended for offering an inspection opportunity of the influent and effluent lines, and optionally to clean them. A particular shape is the end pit, in which only one or several discharge outlets are connected to the bottom.

[0003] Inspection pits comprise a main body, also named 0shaft, available in a number of different diameters, for instance 400, 600, 800 and 1000 mm. The usual diameters for the influent and effluent lines to be connected thereto are 110, 125, 160, 200, 250, 315, 400 and 500 mm.

[0004] In the inspection pit a flow-through channel has been disposed between the influent opening and the effluent opening, which flow-through channel usually has a semi-circular bottom profile in cross-section, optionally elevated by means of vertical walls up to the upper side inside tube of the largest connected pipe. Remaining surfaces (banks) discharge at a fall to the flow profile. Thus the flow-through channel is accessible from above.

[0005] Up until now a separate flow-through channel had to be made for each of the said connection diameters and for each connection variety (diameter difference). This applies to each shape of flow-through channel, namely straight designs, curved designs, T-designs, etcetera.

[0006] The flow-through channels are usually formed in a bottom portion that has been placed at the bottom in the shaft. In addition to the flow-through channel such a bottom portion is provided with bottom plates sloping downward to the flow-through channel, the so-called banks.

[0007] A drawback is that for each connection diameter, unequal or different at the influent side and the effluent side, a separate mould will in principle be necessary. The necessity of having the series of different embodiments of bottom flow profiles or bottom portions, also keeps the provider of such systems from offering flow channel bottoms having changing diameter connections. A mould for it would be too expensive. For that reason everyday practice shows that the user of such systems prescribes the use of separate adapters to be disposed beyond the pit body. A flow channel bottom namely has to be as streamlined as possible, generate as little additional flow resistance as possible. It will have to be fitted separately in the system by the fitter.

[0008] It is an object of the invention to provide an inspection pit that improves on this.

[0009] From one aspect the invention provides an inspection pit comprising a bottom and a circumferential wall, wherein the circumferential wall is provided with at least one upstream and one downstream passageway for receipt and discharge, respectively, of waste water and the bottom is provided with a channel for passage of the waste water from the upstream passageway to the downstream passageway, wherein both passageways are adapted for connection to a supply pipe and a discharge pipe, respectively, wherein the channel and the passageways form passages having flow cross-sections and the inspection pit at the location of the interconnection between at least two of the passages is provided with an accommodation space for a transition piece for if necessary defining a flow transition between those two passages.

[0010] In this way it is achieved that a channel having a certain flow cross-section can be utilised for pipes to be connected of the same as well as a different flow cross-section (particularly for two successive connection diameters), so that the series of channels to be made can be kept limited. The adjustment to the pipe to be connected can easily be realised when manufacturing the inspection pit, by if necessary, placing a transition piece. The number of moulds necessary can thus be reduced.

[0011] In one embodiment both passages to be interconnected have flow cross-sections of a different size.

[0012] In one embodiment both passages to be interconnected have flow cross-sections of an equal size.

[0013] It is possible here by leaving out the transition piece, to realise a largest flow cross-section and for obtaining a smaller flow cross-section to use a suitable transition piece.

[0014] In order to limit the flow resistance at the transition, the transition piece used may have an inner surface designed for smooth connection to the inner surfaces of both passages, at least as regards a lowermost portion of the passages in question. Both passages may have a lowermost portion that is semi-circular.

[0015] The inner sides of the bottoms of both passages may be aligned for forming a watercourse without thresholds.

[0016] The flow may be further improved when the transition piece has a smallest thickness, considered in flow direction, at the location of the middle of the bottom. The thickness of the transition piece can increase in a direction away from the middle of the bottom, as a result of which at higher locations in the cross-section length is provided for changing the position of the flow-bounding surfaces.

[0017] In one embodiment the transition piece defines a circumferential inner surface, as a result of which the flow in transfer can be guided to a larger cross-section in upward direction as well. If at one side of the transition piece a circular passageway opening is formed, a proper connection to the influent or effluent pipe can be realised. At the opposite side the transition piece may have a pas-

sageway opening that deviates from a circular shape, preferably having a largest size in the vertical direction of the flow cross-section.

[0018] In one embodiment at least at the location of the upstream passageway an accommodation space for a transition piece is situated. If necessary a suitable transition from influent side to channel can be effected by placing a transition piece there. The normative flow cross-section of the channel can be larger than the one of at least the upstream passageway.

[0019] Alternatively or in addition at least at the location of the downstream passageway an accommodation space for a transition piece can be situated. The normative flow cross-section of the channel can be smaller than the one of at least the downstream passageway. Alternatively the normative flow cross-section of the channel can be larger than the one of the downstream passageway.

[0020] In one embodiment the channel in the bottom defines a passage with a substantially constant flow cross-section. In another embodiment the channel in the bottom defines a passage with a different flow cross-section at the ends.

[0021] If the accommodation space is situated at the inside of the circumferential wall, the outer circumference of the circumferential wall can remain unchanged, optionally including integrally formed connection stubs.

[0022] In one embodiment the bottom including channel has been formed as one piece, preferably having bank forming bottom plates over which water can run down to the channel.

[0023] The bottom can be formed by injection moulding, vacuum moulding, blow moulding, rotation moulding etc., preferably of a thermoplastic material.

[0024] From a further, more general aspect the invention provides an inspection pit comprising a bottom and a circumferential wall, wherein the circumferential wall is provided with at least one passageway for receipt or discharge of waste water and the bottom is provided with a channel for passage of the waste water from or to the passageway, wherein the passageway is adapted for connection to a supply pipe or a discharge pipe, wherein the channel and the passageway form passages having flow cross-sections, and the inspection pit at the location of the interconnection between the passages is provided with an accommodation space for a transition piece for if necessary defining a flow transition between said two passages. In that way the transition piece can also be used in a so-called end pit.

[0025] From a further aspect the invention provides a transition piece suitable and intended for an inspection pit according to the invention.

[0026] From a further aspect the invention provides a water discharge system provided with an inspection pit according to the invention.

[0027] The aspects and measures described and/or shown in the application may where possible also be used individually. Said individual aspects may be the subject of divisional patent applications relating thereto.

[0028] The invention will be elucidated on the basis of an exemplary embodiment shown in the attached drawings, in which:

Figure 1 shows a schematic vertical cross-section of an arrangement with an exemplary embodiment of an inspection pit according to the invention;

Figure 2 shows a view in perspective of an exemplary embodiment of a bottom portion of the inspection pit of figure 1;

Figure 3A shows an exploded view of a bottom portion of the inspection pit of figure 1, with influent and effluent connections;

Figure 3B shows a view comparable to the one of figure 3A, however, showing the bank of the bottom portion;

Figures 4A-C show a front view, rear view and partial view of an exemplary embodiment of a transition piece for the inspection pit of figure 1;

Figures 5A-C show views in partial cross-section of different connections of an inspection pit according to the invention and an influent line; and

Figures 5D-G show some cross-sections, in a bottom portion for an inspection pit, an effluent line, an influent line and an alternative bottom portion, respectively.

[0029] The inspection pit 1 shown in figure 1 has been accommodated in a bottom 100 having a paved ground level 101. The inspection pit 1 comprises a straight circle-cylindrical circumferential wall 2 and a lowermost portion 5 with bottom 18, on which, in a fitting manner a bottom portion 6 has been placed. Via connections 7 and 8, formed as one unity with the circumferential wall 2, an influent line 108 and effluent line 107, respectively, are connected to the inspection pit 1. In the upper end 3 the inspection pit 1 is closed off by a street lid 4, whether or not by means of a setting structure or by using a shaft diameter adapter.

[0030] The inspection pit 1 may have been manufactured in parts for instance by injection moulding a suitable synthetic material, particularly thermoplastic synthetic material. The circumferential wall 2 can be formed as one unity with the connections 7 and 8 as well as the bottom plate 18, and also the bottom portion 6 can be formed as one unity per se. The circumferential wall may also consist of an extrudate in which spouts/pipe stubs are disposed afterwards.

[0031] The bottom portion 6 shown in figure 2 is a hollow body having a circumferential wall 15 and an upper wall 14, which upper wall 14 is divided into two surfaces

14a, 14b by a channel 9, which for instance at a bend runs slightly curved and to which the surfaces (banks) 14a, 14b dewater. In top view the bottom portion 6 is circular.

[0032] The channel 9 has a cross-section as schematically shown in figure 5D, having a semi-circular bottom 13 and side walls 12a, 12b that are perpendicularly upright therefrom.

[0033] At the ends 10 and 11 of the channel 9 mortises 16 have been provided of which the function will be discussed below. Between the walls 12a, 12b and 13 and the mortise 16 inclined transition walls 17 have been formed.

[0034] Figure 3A shows a possible diameter course. The connection pipe piece 8, that has been formed as one unity with the circumferential wall 2, has a diameter D1 (figure 5F), which is smaller than the diameter D2 of the circle defining the bottom area 13 of the channel 9 (figure 5D). At the effluent end the channel 9 still has a diameter D2, whereas the connection piece at the effluent side 7 has a slightly larger diameter D3 (figure 5E). By way of example figure 5G shows an alternative for channel 9, wherein the banks connect directly to a semi-circular bottom.

[0035] By way of example: the diameter D1 may be 144 mm, so that in case of a wall thickness of 8 mm the external pipe size is 160 mm. The diameter D2 may be 170 mm and the internal diameter D3 180 mm (in case of a wall thickness of 10 mm an external diameter of 200 mm). See figures 5D-F as well.

[0036] The flow-through surface of the influent line 8 then is ¼ x p x 144^2 = 16286 mm^2. The flow-through surface of the effluent line is ¼ x p x 180^2 = 25446 $_{mm2.}$

[0037] By choosing the diameter D2 of the channel 9 somewhere in between them, in the example at 170 mm, both line sizes (influent and effluent) can be served using the same channel profile. The surface shown in figure 5D then is (½ x ¼ x p x 170^2) + (170 x 85) = 25799 mm^2.

[0038] If the connection of the bank surfaces 14a, 14b is placed lower by reducing the value 12a, b (in the most extreme case to nil so that the banks connect to the upper edges of the circular bottom area 13, see figure 5G), the flow-through profile of the channel 9 itself is reduced. It will be understood that there is freedom in designing here.

[0039] In the figures 3A and 3B use is made of the mortise 16 at the location of the transition between the connection piece 7 and the channel 9, in which mortise a collar 7a projecting inward from the circumferential wall 2 fits. The inclined transition surfaces 17 ensure a smooth transition from the channel 9 to connection piece 7.

[0040] At the influent side a transition piece 20 according to an embodiment of the invention is shown between the channel 9 and connection piece 8, which with a collar 8a extends inward from the circumferential wall 2. Said transition piece 20 is further shown in figures 4A-C.

[0041] The transition piece 20 is for instance manufactured by injection moulding a synthetic material and has a front side, shown in figure 4A, and a rear side, shown in figure 4B. The rear side is intended to be facing the inner surface of the circumferential wall 2. The transition piece can also be designed solid, foamed, hollow, open at one side or without ribs.

[0042] The transition piece can be looped/circumferential or U-shaped. In this example the transition piece 20 defines a looped passageway 25, which at the upper side is bounded by a transverse portion 22, at the sides is bounded by legs 21, and at the lower side is bounded by bottom portion 23, wherein the parts 21, 22 and 23 form one unity with each other. At the side and at the bottom a flange 26 is formed, that fits in mortise 16 of bottom portion 6, at the location of end 10 or 11.

[0043] At the upper side the transverse portion 22 is formed with an upper plate 27 having a convex rear edge 24, the curvature of which matches the curvature of the inner surface of the circumferential wall 2.

[0044] As can be seen in figure 4C the bottom area 23 is thinnest, and it is enlarged as regards thickness in the legs 21, so as to have its largest thickness in the transverse portion 22. The legs 21 are V-shaped in cross-section, having a transitional surface 21a for flow guidance and an outer surface 21 b. The incline of the surface 21 b matches the incline of the surface 17. The transverse portion 22 has a convex or inclined lower surface 22a.

[0045] The transition piece 20 forms a transition having a circular opening 25a at the rear side, having a diameter D4 preferably corresponding with diameter D1, and at the channel side having an enlarged passageway 25b, through said inclined surfaces 21 a and inclined lower surface 22a.

[0046] In that way, as shown in figure 3B, by using a transition piece (which after placement can for instance be welded to the rest of the pit) a smooth widening in the flow-through profile can be effected, from connection piece 8 to channel 9. Also see figure 5B. It can be seen that the upper plate 27 is contiguous in one plane to the bank surfaces 14a, 14b.

[0047] In figure 5A it can be seen how the connection would be if no transition piece 20 were used. Comparing figures 5A and 5B shows that by using a transition piece according to the invention a smooth transition without thresholds is created. The bottom area 23 is in line with the axial line of the bottom areas 13 of the channel 9 and of the connection piece 8. The inclined surfaces 21 a and 22a are formed such that a transition is realised that is smooth and without thresholds as much as possible.

[0048] In figure 5C a situation is shown in which, with respect to D2, connection piece 8 has a larger diameter D5, of 180 mm. Due to the small difference between 180 mm and 170 mm (diameter D2), it is possible here to leave out a transition piece. The inclined walls 17 and 11 ensure a smooth transition between these two diameters.

[0049] In this example the bottom portion 6 with channel 9 having diameter D2 of 170 mm can be used without transition pieces with the influent and effluent lines having an outer diameter of 200 mm, with transition pieces 20 for influent and effluent lines having an outer diameter of

160 mm, and, as is the case in the example, with one transition piece 20 at the influent side, in case of a influent line having an outer diameter of 160 mm and an effluent line having an outer diameter of 200 mm.

[0050] All this leads to a strong reduction of the number of manufacturing moulds for the bottom portion 6. The added costs for manufacturing the transition pieces are much lower than the economy that can be realised as regards bottom profile moulds, by making a flow profile bottom suitable for connection to several diameters.

[0051] As a result it is possible, against comparable costs, to offer a wider range of flow profile bottom varieties.

[0052] By way of example various embodiments are possible. For instance, for influent and effluent, respectively, (flow-through surfaces) 110 mm can be combined with 125 mm, 160 mm with 200 mm, 250 mm with 315 mm, or 400 mm with 500 mm. It is also possible to combine 125 mm with 160 mm. It is also possible to combine three successive diameters, for instance 110 mm, 125 mm and 160 mm with a bottom of for instance 138 mm internally with connections of 160 mm and using transition pieces according to the invention at the location of the connections at 110 mm and 125 mm.

[0053] In this way a synthetic inspection pit is provided having a flow profile which by using or leaving out transition pieces can be used for several consecutive connection diameters. Optionally changing bottom diameters are possible by selectively placing said internal transition pieces.

Claims

1. Inspection pit comprising a bottom and a circumferential wall, wherein the circumferential wall is provided with at least one upstream and one downstream passageway for receipt and discharge, respectively, of waste water and the bottom is provided with a channel for passage of the waste water from the upstream passageway to the downstream passageway, wherein both passageways are adapted for connection to a supply pipe and a discharge pipe, respectively, wherein the channel and the passageways form passages having flow cross-sections and the inspection pit at the location of the interconnection between at least two of the passages is provided with an accommodation space for a transition piece for if necessary defining a flow transition between those two passages.

2. Inspection pit according to claim 1, wherein both passages to be interconnected have flow cross-sections of a different size.

3. Inspection pit according to claim 1, wherein both passages to be interconnected have flow cross-sections of an equal size.

4. Inspection pit according to claim 1, 2 or 3, having a transition piece having an inner surface designed for smooth connection to the inner surfaces of both passages, at least as regards a lowermost portion of the passages in question, wherein both passages preferably have a lowermost portion that is semi-circular.

5. Inspection pit according to any one of the preceding claims, wherein the inner sides of the bottoms of both passages are aligned, wherein the transition piece preferably has a smallest thickness, considered in flow direction, at the location of the middle of the bottom, wherein the thickness of the transition piece preferably increases in a direction away from the middle of the bottom.

6. Inspection pit according to any one of the preceding claims, wherein the transition piece defines a circumferential inner surface, wherein at one side of the transition piece preferably a circular passageway opening is formed, wherein the transition piece preferably at the opposite side has a passageway opening that deviates from a circular shape, preferably having a largest size in the vertical direction of the flow cross-section.

7. Inspection pit according to any one of the preceding claims, wherein at least at the location of the upstream passageway an accommodation space for a transition piece is situated, wherein the normative flow cross-section of the channel preferably is larger than the one of at least the upstream passageway.

8. Inspection pit according to any one of the preceding claims, wherein at least at the location of the downstream passageway an accommodation space for a transition piece is situated, wherein the normative flow cross-section of the channel preferably is smaller than the one of at least the downstream passageway.

9. Inspection pit according to claim 8, wherein at the location of both the upstream and the downstream passageway an accommodation space for a transition piece is situated.

10. Inspection pit according to any one of the preceding claims, wherein the channel in the bottom defines a passage with a substantially constant flow cross-section.

11. Inspection pit according to any one of the preceding claims, wherein the bottom including channel have been formed as one piece, preferably having bank forming bottom plates over which water can run down to the channel, wherein the bottom preferably has been formed by injection moulding, vacuum moulding, blow moulding, rotation moulding etc.,

preferably of a thermoplastic material.

12. Inspection pit comprising a bottom and a circumferential wall, wherein the circumferential wall is provided with at least one upstream and one downstream passageway for receipt and discharge, respectively, of waste water and the bottom is provided with a channel for passage of the waste water from the upstream passageway to the downstream passageway, wherein both passageways are adapted for connection to a supply pipe and a discharge pipe, respectively, wherein the channel and the passageways form passages having flow cross-sections, wherein the circumferential wall at the location of at least one of the passageways is provided with an accommodation space for a passage transition piece between said passageway and the channel.

13. Inspection pit comprising a bottom and a circumferential wall, wherein the circumferential wall is provided with at least one passageway for receipt or discharge of waste water and the bottom is provided with a channel for passage of the waste water from or to the passageway, wherein the passageway is adapted for connection to a supply pipe or a discharge pipe, wherein the channel and the passageway form passages having flow cross-sections, and the inspection pit at the location of the interconnection between the passages is provided with an accommodation space for a transition piece for if necessary defining a flow transition between said two passages.

14. Inspection pit according to any one of the preceding claims, wherein the accommodation space is situated at the inside of the circumferential wall.

15. Transition piece suitable and intended for an inspection pit according to any one of the preceding claims.

16. Water discharge system provided with an inspection pit according to any one of the claims 1-14.

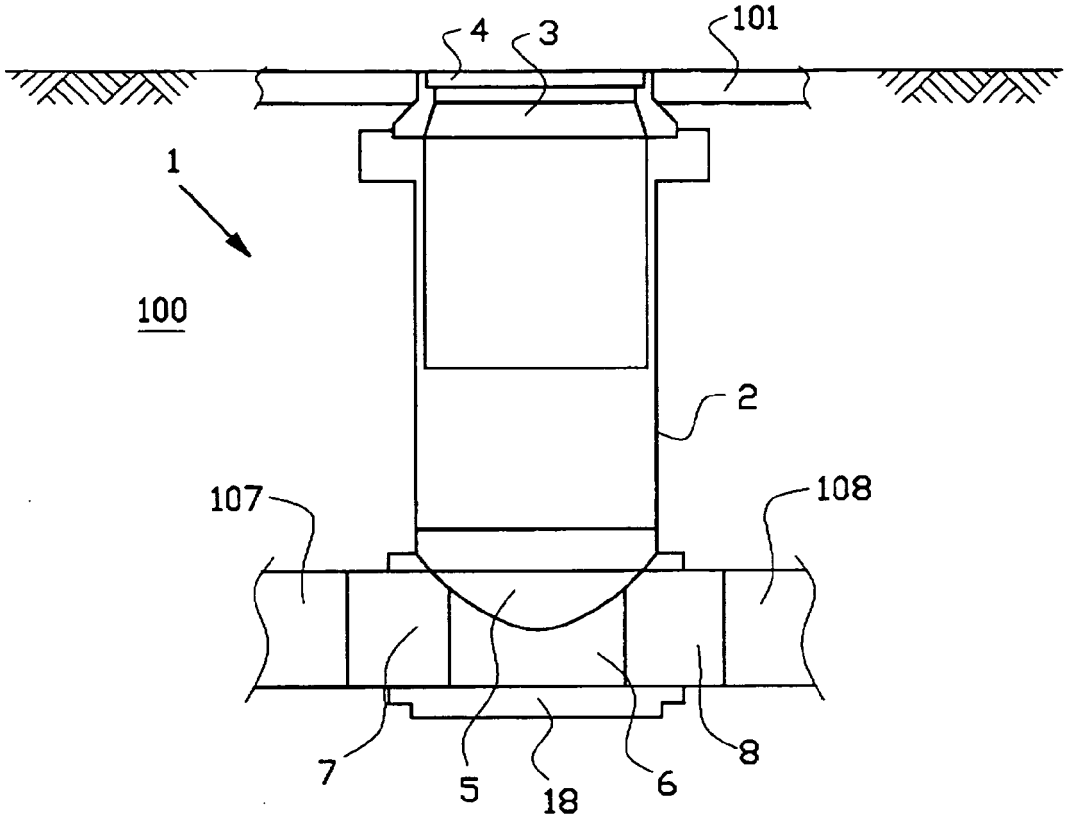

FIG. 1

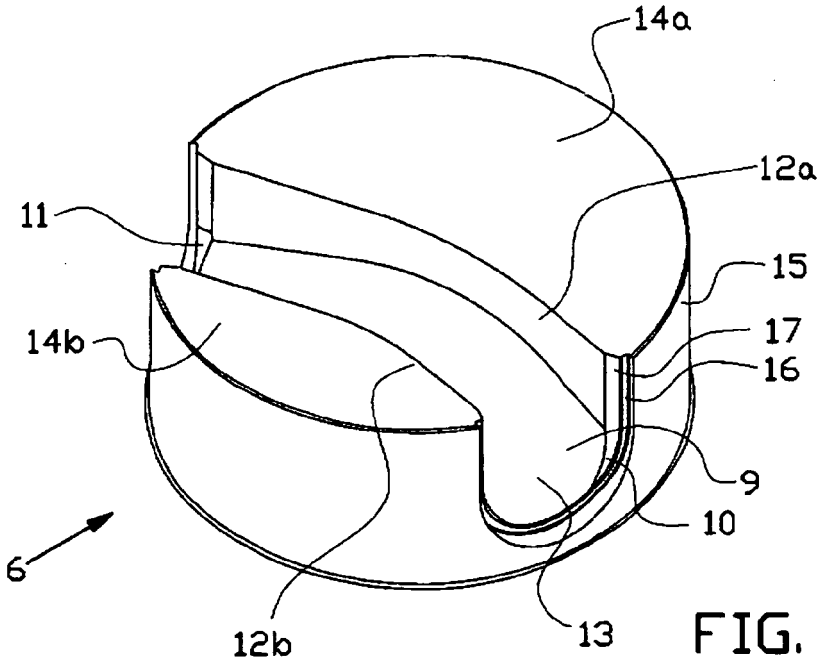

FIG. 2

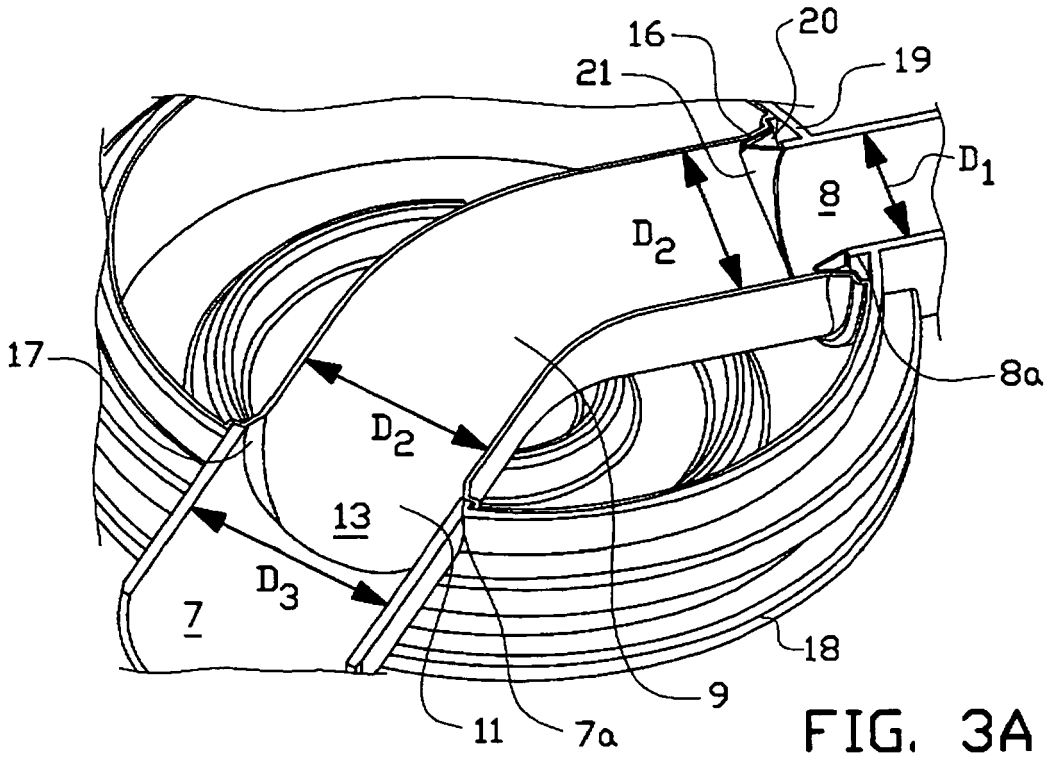

FIG. 3A

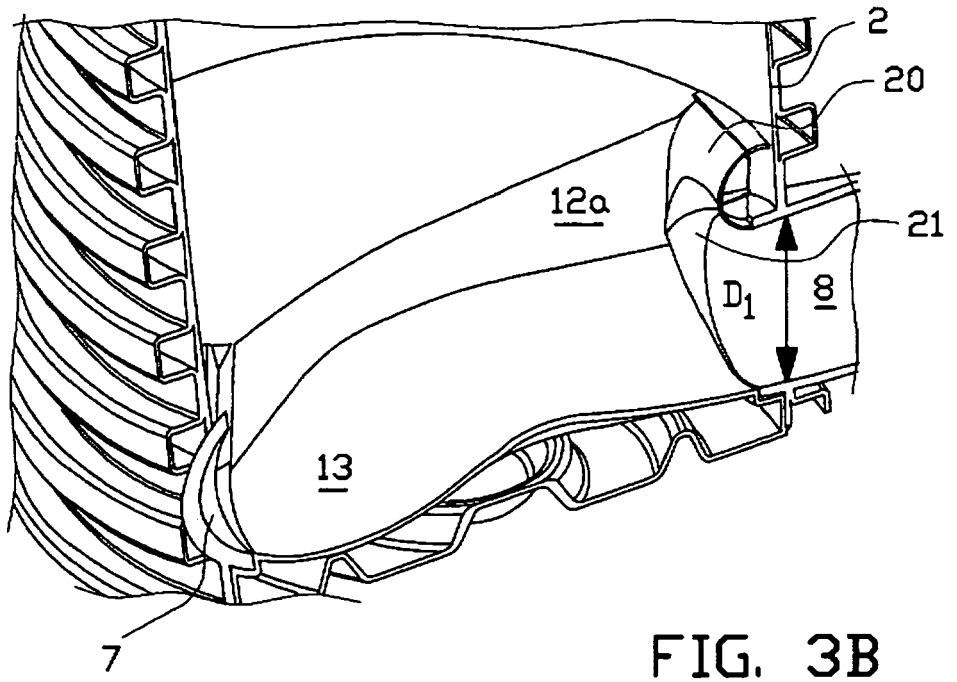

FIG. 3B

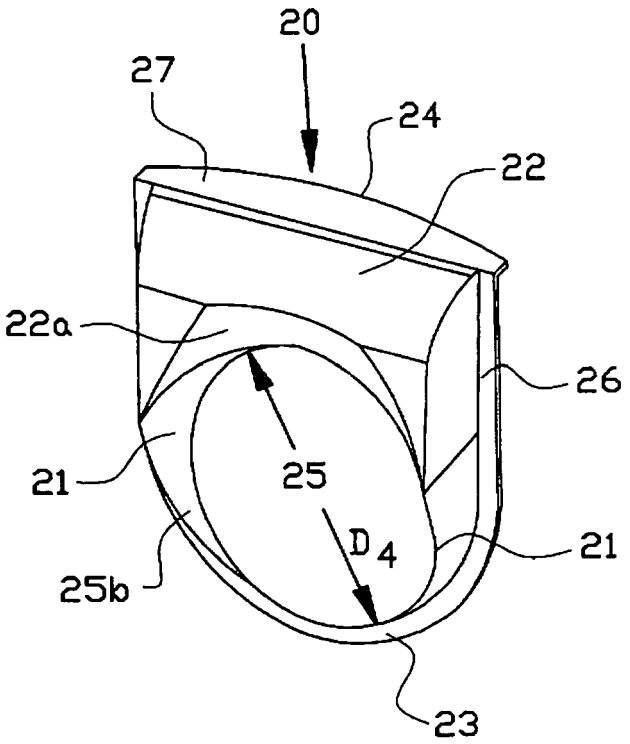

FIG. 4A

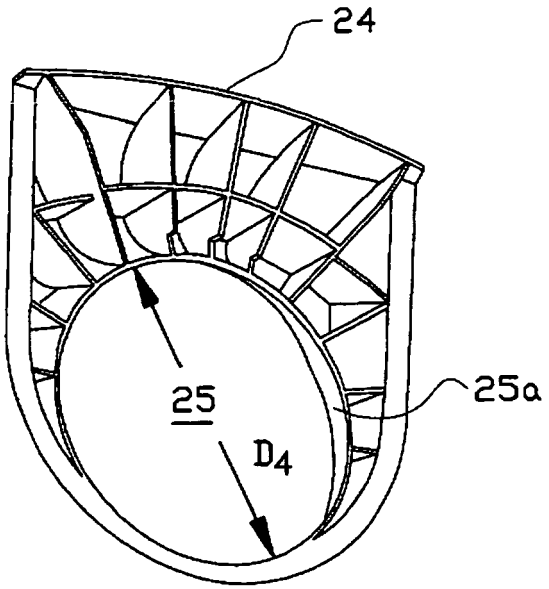

FIG. 4B

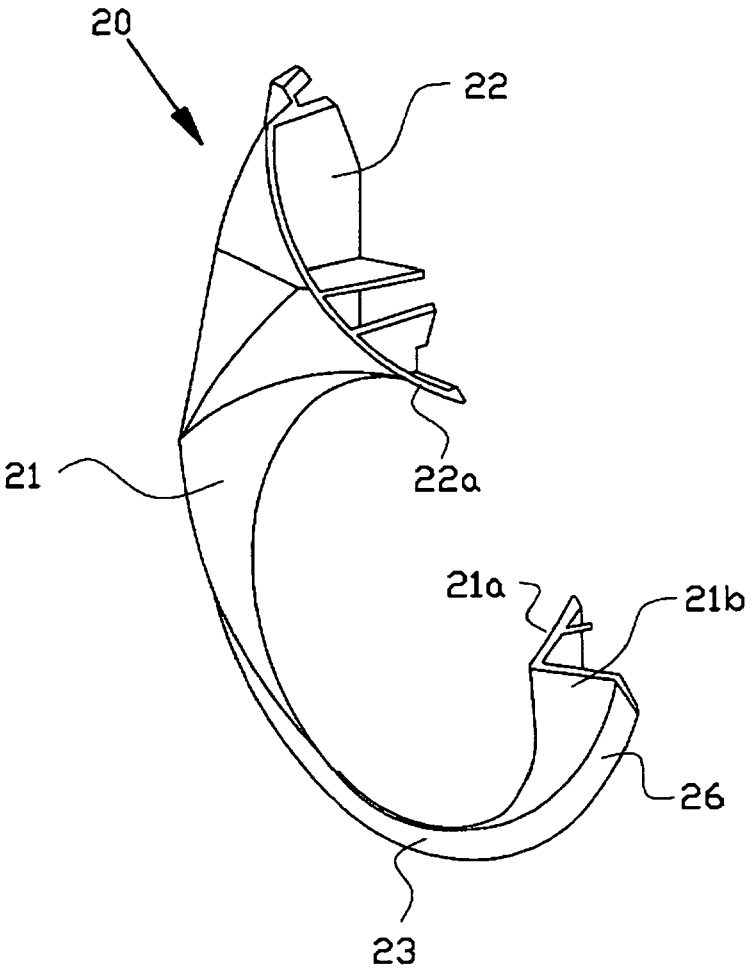

FIG. 4C

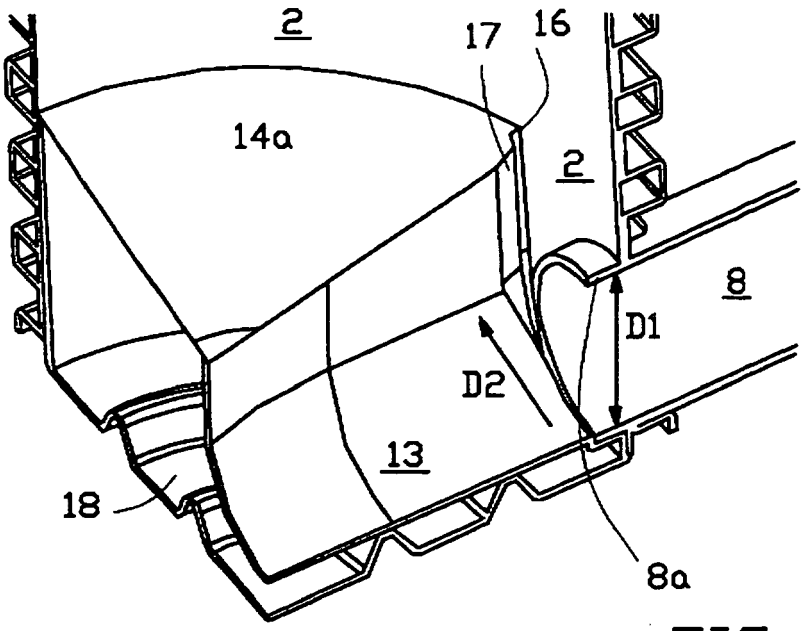

FIG. 5A

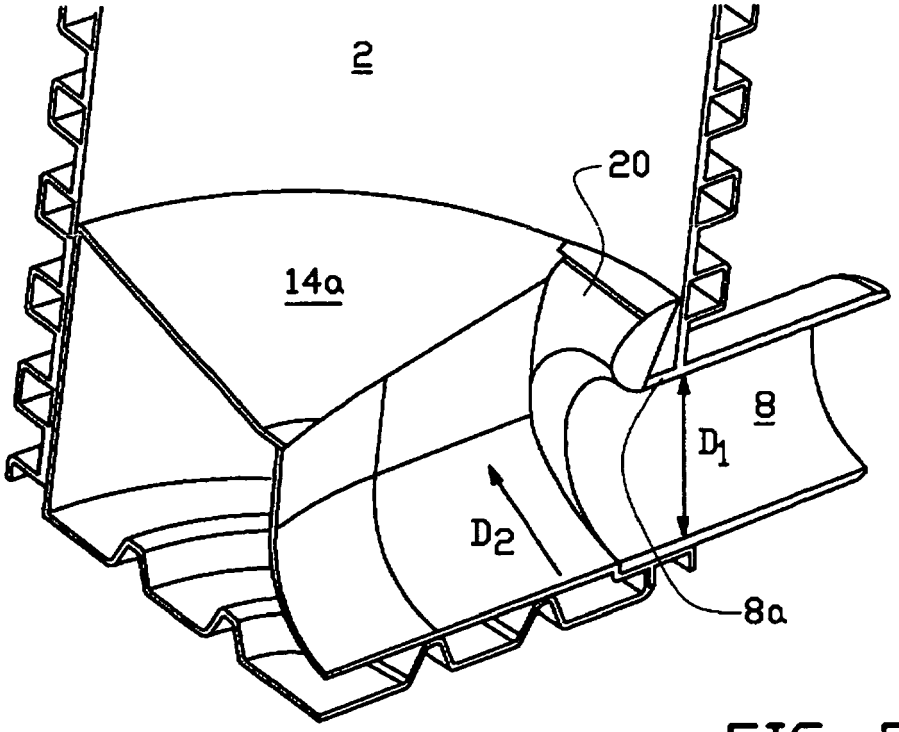

FIG. 5B

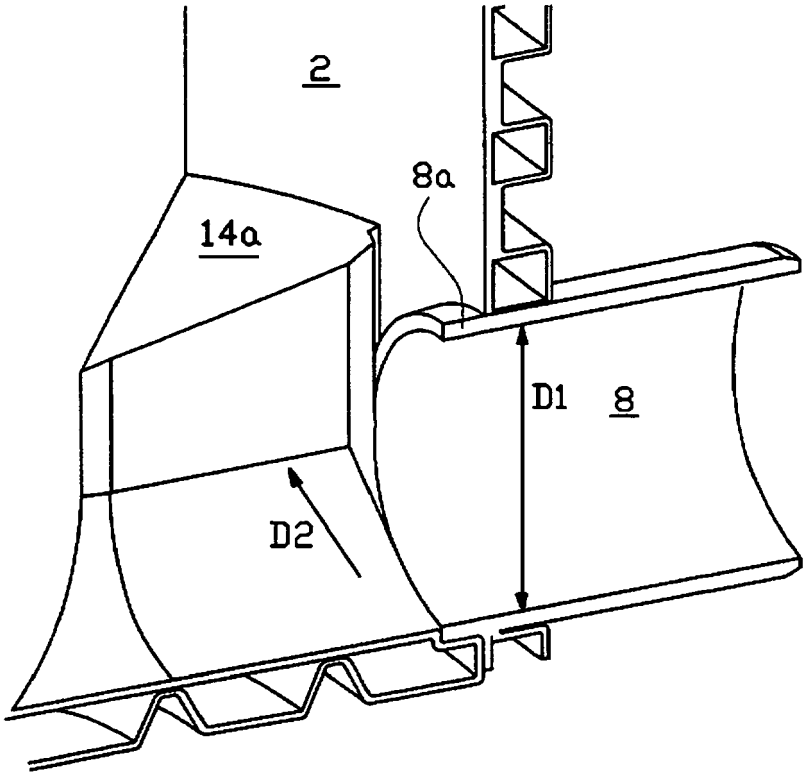

FIG. 5C

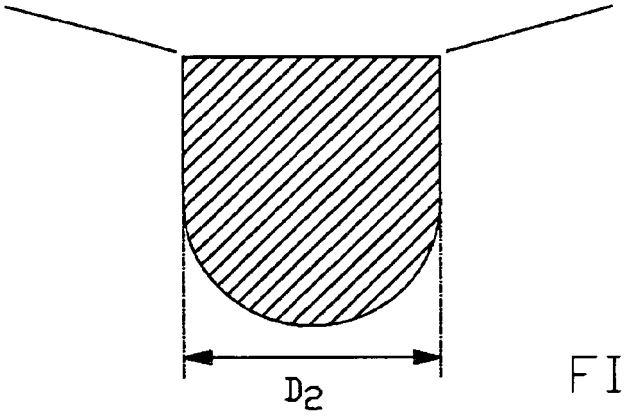

FIG. 5D

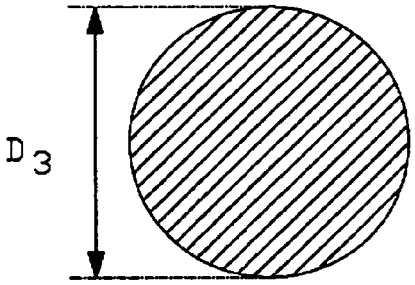

FIG. 5E

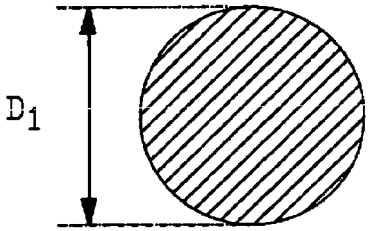

FIG. 5F

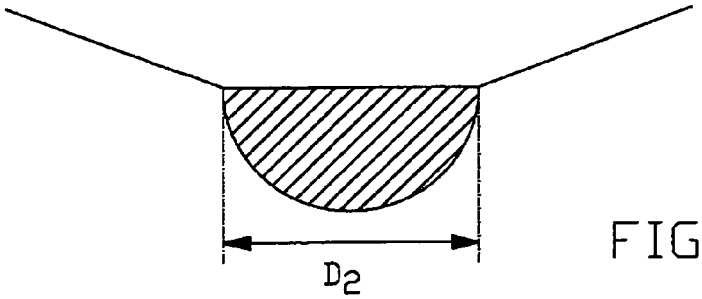

FIG. 5G

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 01 0622

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 1 229 497 A (THORNHILL, ALBERT E.D.) 21 April 1971 (1971-04-21) * page 2, line 52 - line 69; figures 1-4 *	1-16	INV. E03F5/02
X	DE 25 09 909 A1 (WEISS,ANDREAS; WEISS, ANDREAS, 8201 KOLBERMOOR) 16 September 1976 (1976-09-16) * page 4, line 16 - page 5, line 11; figures 1-4 *	1,2,5, 7-14,16	
X	EP 0 670 395 A (H. NIEMEYER SOEHNE GMBH & CO. KG) 6 September 1995 (1995-09-06) * column 3, line 9 - column 4, line 28; figures *	1-3,7, 11-14,16	
A	GB 1 471 862 A (MOLYNEUX LTD) 27 April 1977 (1977-04-27) * column 3, line 102 - line 112; figures 1,2,4,5 *	15	
			TECHNICAL FIELDS SEARCHED (IPC) E03F F15D F25D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 August 2006	Van Bost, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 01 0622

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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14-08-2006

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82