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(54) A venturi jet unit

(57) A venturi jet unit (70) for whirlpool bath assemblies has a main body (72) with a water inlet bore (80), a water outlet bore (86) and a venturi throat (85) of restricted cross-sectional area between the water inlet bore (80) and the water outlet bore (86). An air duct (88) communicates with the water outlet bore (86) immediately downstream of the venturi throat (85). A ball-type outlet jet (73) is mounted in the water outlet bore (86) to receive water from the venturi throat (85) and co-operates with an outlet (91) of the air duct (88) to control air entering the jet (73) for mixing with water in the jet (73) prior to discharge into a bath on which the unit (70) is mounted. Thus, a number of units (70) are mounted around a bath side wall in use and the air entering each unit (70) can be independently controlled for each unit (70). The unit (70) is also self-draining.

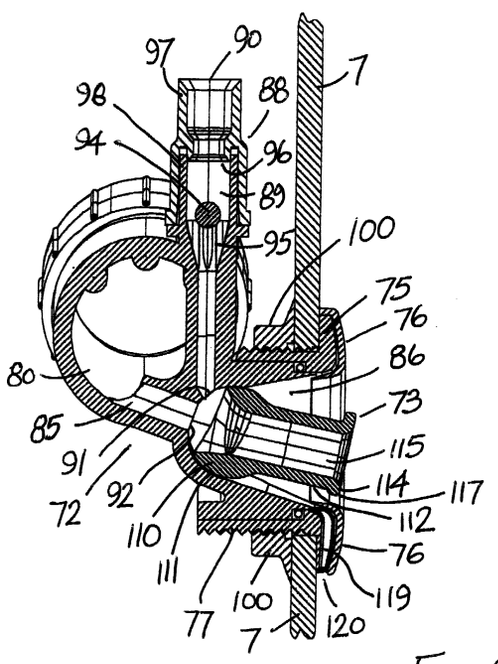

FIG 6

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Description

[0001] The present invention relates to whirlpool bath assemblies and particularly to venturi jet units for mounting therein.

[0002] Such whirlpool bath assemblies comprise a pump recirculation unit, a suction pipe system having an inlet for mounting in a bath and outlet feeding the pump recirculation unit, a venturi jet unit having a water supply unit, an air inlet and combined air and water outlet, venturi mounting means for securing a venturi jet unit to a bath side wall, a system pipe between the pump recirculation unit and the venturi jet unit, a drain-off valve connected to the pump, a waste-pipe and water pipe fed from the drain-off valve and a control unit. Such a whirlpool assembly is described in European Patent Specification No. 0875230.

[0003] The present invention is directed towards providing an improved construction of a venturi bath jet unit for use in such a whirlpool bath assembly. In particular the invention is directed towards providing such a venturi bath jet unit that will be readily easily assembled and efficient in operation.

[0004] The fitting of the venturi jet unit is the most difficult task in the retro-fitting of such whirlpool assemblies. An efficient venturi jet unit and indeed an efficient whirlpool bath assembly should be simple to fit and assemble, particularly when retro-fitted. The part of the whirlpool bath assembly that causes the greatest problems in retro-fitting, or indeed in fitting to new baths is the venturi jet unit itself. Such a venturi jet unit should be simple to fit to a bath wall, and be capable of fitting to bath walls of varying thicknesses.

[0005] It is relatively easy to provide an efficient aerated jet in a whirlpool assembly, however, the problem is that such jets are often too powerful in strength and what is desirable is that the majority of the power of the jet should come from the aeration of the jet and not simply from the pressure of the water since by achieving this a much softer massaging affect of the air entrained jet is achieved. Also in conventional whirlpool configurations, the air inlets are fed to a single central air control, thereby not allowing the user control over the power of the air introduced at each individual jet. The conventional central air control is used to regulate the airflow into the water stream at all jets connected to the air control. Further, such traditional air controls can restrict the volume of air flowing to each jet if too many jets are connected to the one air control.

[0006] Ideally the direction of the aerated jet of water should be pointed downwards in its natural position into the bath to maximise the hydrotherapy affects of the massaging jet. With some conventional types of jets this is not possible as the jet is fixed in a generally horizontal orientation so that when mounted on the bath sidewall which is usually inclined, the jet actually directs water upwardly towards the surface of the water and much of the desired therapeutic affect for the user is lost.

[0007] Preferably the actual power of each of the venturi bath jet units should be easily adjusted not alone for strength of jet, but also for the quantity of air being introduced.

[0008] As has been provided with the whirlpool bath assembly described in European Patent Specification No. 0875230, ideally the venturi bath jet unit assembly should be self-draining and finally and most importantly should be easy to clean. This is one of the major complaints of the users of whirlpool bath assemblies namely that the venturi bath jet unit is generally difficult to clean and there is a build-up of dirt and other contaminants after some time of use.

Statements of Invention

[0009] According to the invention there is provided a bath venturi jet unit including:

a main body having an elongate bore including a water inlet bore, a water outlet bore, a venturi throat of restricted cross-sectional area between the water inlet bore and the water outlet bore;

an air duct having an air inlet and an air outlet communication with the elongate bore; and

mounting means for support of the venturi jet unit against a bath wall, characterised in that means is provided on the unit for independently controlling the volume of air entering the elongate bore through the air duct.

[0010] Thus, advantageously each individual jet of a set of jets mounted on a bath in use can be individually operated to control the air input at each separate jet.

[0011] In one embodiment of the invention the water outlet bore is formed by a ball type outlet jet which cooperates with the air outlet to allow control of air entering the elongate bore through the air duct, the ball type jet having an inner ball end mounted in a complementary socket in the main body for pivotal movement of the ball end within the socket.

[0012] In another embodiment the ball type jet is operable to direct water discharged from the jet in a downward direction when the venturi jet unit is mounted on a bath side wall.

[0013] In a further embodiment an outlet end of the jet is movable between a raised position and a lowered position by pivoting the ball end of the jet within the socket.

[0014] In another embodiment in the lowered position, a bore of the jet is substantially co-axial with a bore of the venturi throat.

[0015] In a preferred embodiment one or more air inlet slots are provided in a side wall of the ball end of the jet, said ball end of the jet being rotatable within the socket for positioning said slot or slots into and out of communication with the air duct outlet.

[0016] In a particularly preferred embodiment a segment of the ball is cut away to provide an air inlet slot for the jet.

[0017] In another embodiment a plurality of spaced-apart radial slots are provided around portion of a side wall of the ball end of the jet.

[0018] In a further embodiment the ball type jet is a snap fit in the socket. Preferably the outlet bore includes an upstanding annular lip for reception of the ball-like end of the jet. Ideally due to the resilience of the material the ball-like end of the jet can be a snap-fit in the socket.

[0019] In another embodiment the air duct outlet is located adjacent an outlet end of the venturi throat.

[0020] In a preferred embodiment a non-return valve is provided in the air duct between the air inlet and the air outlet to prevent backflow of fluids through the air duct from the air outlet to the air inlet.

[0021] Conveniently the elongate bore is oriented within the main body such that when the venturi jet unit is mounted on a bath side wall, the bore slopes downwardly between the water inlet and the water outlet.

Detailed Description of the Invention

[0022] The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only described with reference to the accompanying drawings in which:

Fig. 1 is an exploded perspective view of a venturi bath jet unit according to the invention;

Fig. 2 is a sectional view of the jet unit, again exploded;

Fig. 3 is a sectional view of assembled jet unit on a bath side wall;

Fig. 4 is a sectional view somewhat similar to Fig. 3 showing only portion of the jet unit in a slightly different position;

Fig. 5 is a sectional view of an alternative construction of venturi jet unit according to the invention;

Fig. 6 is a sectional elevational view of another venturi jet unit;

Fig. 7 is a view similar to Fig. 6 showing a jet portion of the unit in another position of use;

Fig. 8 is a sectional elevational view of a jet portion of the unit of Fig. 6;

Fig. 9 is a plan view of the jet portion;

Fig. 10 is an end elevational view of the jet portion; and

Fig. 11 is an enlarged detail view of part of the jet portion.

[0023] Referring to the drawings and initially to Figs. 1 to 4 and specifically to Figs. 1 to 2, there is provided a venturi jet unit indicated generally by the reference numeral 1 which comprises five separate sub-assemblies, namely a main body indicated generally by the reference numeral 2, a ball type outlet jet indicated generally by the reference numeral 3, a washer 4, mounting connector 5 and face-plate 6. The ball type jet 3 is often referred to as an eyeball. The venturi bath jet unit 1 is shown in Fig. 3 mounted on a bath wall identified by the reference numeral 7.

[0024] The main body 2 comprises a water inlet bore formed from a pair of inlet pipes 10 each having an annular socket or groove 11 for reception of an O-ring, not shown. It will be noted that each inlet pipe 10 is angled upwards for reception of a water carrying pipe such as that made from PVC or polyethylene and sold under the Trade Mark QUALPLEX. The water inlet bore formed by the inlet pipes 10 feeds to a venturi throat 15 of restricted cross-section, which venturi throat 15 in turn feeds to a water outlet bore 20. An air inlet pipe 25 has a bore 26 which connects at 27 with the water outlet bore 20 immediately adjacent an outlet end of the venturi throat 15. The water outlet bore 20 carries an inwardly directed upstanding annular lip 28.

[0025] Mounting means for the main body 2 is provided by the mounting connector 5 and a threaded socket 30 in the main body 2. The main body 2 also incorporates a flange 31 having an annular seal receiving socket 32. The flange 31 has a face 33 defining a unit mounting surface.

[0026] The ball type outlet jet 3 comprises a ball-like portion 40 and an outer elongate extension piece 41 which terminates in an annular knurled rim 42. The ball type outlet jet 3 has an inner passageway 43. The ball-like portion 40 contains a plurality of external slots 44 and this can be most clearly seen in Fig. 4. This facilitates drainage of water from the unit.

[0027] To mount the venturi jet unit 1 against a bath wall 7 the face 33 with the slot 32 containing the washer 4 is offered up against the outside face of the bath wall 7 and the mounting connector 5 is screwed into the socket 30 until the venturi jet unit 1 is secured in position. Then the face plate 6 is snapped into position. The ball type outlet jet 3 can then snapped into position behind the lip 28.

[0028] The mounting connector 5 has external threads 51 and a flange 52 carrying on its inner face an o-ring receiving socket 53 and on its outer face a series of drain-off holes 54.

[0029] The face plate 6 is provided with a drain-off channel 56 which is always located at the lowest part of the venturi jet unit 1.

[0030] In operation, the knurled rim 42 may be used to rotate the ball type outlet jet 3 with respect to the air

inlet at 27. Depending on the orientation of the ball-like portion 40, the amount of air entering the venturi jet unit 1 immediately downstream of the venturi throat 15 is controlled. Similarly if the ball type outlet jet 3 is pivoted into the horizontal position as shown in Fig. 3 the air inlet is cut off and there is no air delivered into the venturi jet unit 1. By mixing water and air in what is effectively a narrow channel such as behind the ball type outlet jet 3, the water exiting the venturi throat 15 is spread outwards to meet the walls of the passageway 43, thereby creating a vacuum behind it which will draw even further air into the passageway 43. Since the passageway 43 is longer than the conventional passageway provided by most ball type outlet jets, the aeration of the water is optimised for any given water pressure.

[0031] It will be appreciated that by maximising the power of the jet by optimising the aeration affect provides a softer jet, as it were, than was achieved heretofore.

[0032] Referring to Fig. 5 there is illustrated an alternative construction of venturi jet unit indicated generally by the reference numeral 60 in which parts similar to those described with reference to the previous drawings are identified by the same reference numerals. In this embodiment there is only one water inlet pipe 61.

[0033] Referring now to Figs. 6 to 11, there is shown another bath venturi jet unit, indicated generally by the reference numeral 70. Parts similar to those described previously are assigned the same reference numerals. The unit 70 has a main body 72 within which a ball type outlet jet 73 is mounted. A mounting connector 75 secures the main body 72 on the bath wall 7. A face plate 76 provides a decorative facade for the mounting connector 75.

[0034] The main body 72 has a water inlet bore formed by an inlet pipe 80. It will be noted that the inlet pipe 80 is angled upwardly so that it will drain into the bath. The water inlet pipe 80 communicates with a venturi throat 85 of restricted cross-section, which venturi throat 85 in turn connects with a water outlet bore 86. The venturi throat 85 is inclined downwardly between an inlet and an outlet of the throat 85. An air duct 88 has a bore 89 with an air inlet 90 and an air outlet 91 located immediately adjacent an outlet end 92 of the venturi throat 85.

[0035] A non-return valve is formed within the bore 89 and comprises a ball 94 supported on ribs 95 on the sidewall when the valve is in an open position which allow through passage of air past the ball 94 between the air inlet 90 and air outlet 91. The ball 94 cooperates with a complementary valve seat 96 to prevent any backflush of fluid through the bore 89 of the air inlet duct 88. The valve seat 96 is formed within a tubular valve sleeve 97 which engages with a complementary mounting spigot 98 on the main body 72.

[0036] The mounting connector 75 has a tubular body 77 which extends through the bath wall 7 with a flanged outer end 78 which engages against the inner face of the bath wall 7 and the connector 75 and is secured to the bath wall 7 by means of an associated lock nut 100 which engages an outer face of the bath wall 7. The main body 72 slides within a bore of the mounting connector 75 and is secured thereto by adhesive. The face plate 76 engages with and is secured to the mounting connector 75 by means of a bayonet type connection.

[0037] The jet 73 has an inner ball end 110 connected to a tubular outer portion 112 which terminates in an annular knurled rim 114. An inner bore or passageway 115 extends through the jet 73 for reception of water from the venturi throat 85 for delivery into the bath. The ball end 110 is a snap-fit in a complementary socket 111 formed at an inner end of the water outlet bore 86. Thus, the ball end 110 can be swiveled within the socket 111 to direct water from the jet 73 into the bath as desired. It will be noted that an oblique section, indicated generally at 116, is cut-away at an inlet end of the ball end 110 to provide an air inlet slot. This allows the ball end 110 to be used as a valve for controlling air inlet from the air inlet duct 88 into the bore 115 by rotating the jet 73 between a fully open position as shown in Fig. 6 for full air flow and a closed position as shown in Fig. 7 wherein the ball end 110 closes off the air outlet 91. This only allows water to flow through the jet 73. If the water flow through the jet 73 is blocked by covering the outlet end of the jet 73, water will be forced up through the air duct 88, providing this is not shut off by the jet ball end 110. Should this happen, the ball 94 will rise and engage against the valve 96 to prevent any escape of water. It will be noted from Fig. 10 that the knurled rim 114 is shaped such that it indicates the orientation of the jet 73 within the socket. When a flattened portion 117 of the rim 114 is lowermost, this corresponds to the position shown in Fig. 6 for maximum air throughput.

[0038] A drain channel 118 is provided centrally in a bottom of the socket 111 to allow drainage of water past the ball end 110 of the jet 73 after use to prevent any collection of stagnant water within the unit 70. A drain slot 119 is provided in the flange 78 of the mounting connector 75 and a corresponding opening 120 is provided at a bottom of the face plate 76 to allow drainage of water from the unit 70 into the bath after use.

[0039] In use, a number of the venturi jet units 70 are mounted around a side wall of a bath and connected by a series of pipes to a centrifugal pump. To fit each venturi jet unit 70 to the bath, a hole is drilled in the bath wall 7 and the mounting connector 75 is inserted through this hole and secured to the bath wall 7 by tightening the lock nut 100. The main body 72 is then inserted into and glued to the mounting connector 75. Then the jet 73 is snapped into the socket 111 of the main body 72. The free-floating ball 94 is dropped into the spigot 98 onto the ribs 95 and the valve sleeve 97 is secured over the spigot 98 to form the non-return valve. Each inlet pipe 80 is connected to the centrifugal pump for reception of water from the pump. It will be appreciated that the assembly and mounting of a number of the jet units 70 on

a bath is relatively quick and easy. In operation, water is recirculated by the centrifugal pump from the bath through the jet units 70 entering the water inlet pipe 80 and passing through the venturi throat 85 through the central bore 115 of the jet 73 and into the bath. As water flows through the jet 73, air is drawn into the water stream through the air inlet duct 88, when the jet is in the open position shown in Fig. 6, the air mixing with the water to create a highly aerated jet. It will be noted that the jet 73 can be angled to direct the stream of aerated water downwardly towards a bottom of the bath to maximise the therapeutic benefit to the bather.

[0040] It will also be noted that when the jet 73 is in the lowered position as shown in Fig. 6 the central bore 115 of the jet 73 is substantially in alignment with the bore of the venturi throat 95 for optimum aeration action in this position. Thus, advantageously the aerated jet in this optimised position is directed down onto and under a bather's body, thereby maximising the therapeutic benefits to the bather.

[0041] It will be appreciated that the bath venturi unit of the invention is of relatively simple construction which can be readily easily and quickly installed on a bath. Further, independent control of the air supply to each jet can be achieved by manipulation of the jets. By drawing air into the jet from the atmosphere without the use of a traditional air control this can allow a greater volume of air to be supplied to each jet. This arrangement also eliminates the necessity to pipe the air inlets back to a central air control unit. This is extremely beneficial as it greatly reduces fitting time due to the absence of air control, manifolds and air pipes. Thus, the cost of the system is further reduced.

[0042] It will be appreciated that the water inlet pipes according to the present invention can receive any suitable pipes, such as a plastics pipe sold under the Trade Mark QUALPLEX. It is also envisaged that any suitable connection means may be used to secure the QUALPLEX pipe in position.

[0043] It will also be appreciated that the siting of the air inlet pipe leads to savings in space. Indeed it will be appreciated that with the designs of venturi jet unit according to the present invention that considerable reductions in space requirements can be achieved.

[0044] It will also be appreciated that the use of different thicknesses of washer such as the washer 4 can allow the venturi jet unit to accommodate many sizes of bath.

[0045] The particular ball type outlet jet according to the present invention has the great advantage that the thickness of the bath wall will not in any way affect its performance as the actual jet is always located in the same position.

[0046] One of the great advantages according to the present invention is that by using aeration to optimise power this means there will be less water pressure required to optimise performance which will allow for smaller pumps to be used, it will also be appreciated that the venturi jet unit according to the present invention has its venturi throat placed in a downward direction such that even though the bath side walls slope inwards, the jet will operate to optimum affect with the ball type outlet jet also in the horizontal position.

[0047] It is envisaged that the venturi throat would be angled at approximately 20° to the unit mounting surface, but it is obviously not restricted to this angle.

[0048] One of the great advantages of this particular construction is that it allows the bather to angle the jet downwards into the bath at the optimum angle for bather comfort.

[0049] It will be appreciated that the ball type outlet jet can be easily snapped in and out of position for cleaning.

[0050] It will be appreciated that while with the present invention an annular lip and snap-on connection for the ball type outlet jet has been provided that any other suitable means such as the use of an o-ring or other clamping device could be used.

[0051] It will also be appreciated that by having the back face of the ball type outlet jet effectively elliptical that the turning of the ball type outlet jet will change the amount of air that will be allowed into the venturi jet unit 1. Thus, the actual amount of air being delivered by each venturi jet unit can be independently controlled rather than by having one overall control.

[0052] It will be appreciated that it is not always necessary to have both slots and elliptical endplate on the ball type outlet jet.

[0053] A great advantage of the present invention therefore is that there is no need for any air control, air pipelines, manifolds and so on. By keeping the air control totally separate for each venturi jet unit the fitting and maintenance is greatly reduced.

[0054] It will be appreciated that the venturi jet unit according to the present invention is totally self-draining if placed on a bath wall where the degree of slope is less on the lowest point of the main body.

[0055] It will be appreciated that any water or air in the venturi jet unit will drain through the venturi throat into the water outlet bore and then out into the bath. Thus, no build-up of stagnant water within the unit can occur.

[0056] It will also be appreciated that slots may also be provided in various portions of the main body to facilitate draining.

[0057] It will be appreciated that the ball-like portion can be manufactured without the slots on its surface.

[0058] It is envisaged that the various components of the venturi jet unit will be manufactured on multi-impression injection moulding tools with no additional manufacturing required.

[0059] It has been found that the installation time has been greatly reduced with the present invention.

[0060] In the specification the terms "comprise, comprises, comprised and comprising" or any variation thereof and the terms "include, includes, included and

including" or any variation thereof are considered to be totally interchangeable and they should all be afforded the widest possible interpretation and vice versa.

[0061] The invention is not limited to the embodiments hereinbefore described, but may be varied in both construction and detail within the scope of the appended claims.

Claims

1. A bath venturi jet unit (70) including:-

a main body (72) having an elongate bore including a water inlet bore (80), a water outlet bore (86), a venturi throat (85)of restricted cross-sectional area between the water inlet bore (80)and the water outlet bore (86),

an air duct (88) having an air inlet (90) and an air outlet (91) communicating with the elongate bore, and

mounting means (75, 100) for support of the venturi jet unit against a bath wall (7),

characterised in that means (110, 116) is provided on the unit for independently controlling the volume of air entering the elongate bore through the air duct (88).

2. A bath venturi jet unit (70) as claimed in claim 1, wherein the water outlet bore (86) has a ball type outlet jet (73) mounted therein which co-operates with the air outlet (91) to allow control of air entering the elongate bore through the air duct (88), the ball type jet (73) having an inner ball end (110) mounted in a complementary socket (111) in the main body (72) for pivotal movement of the ball end (110) within the socket (111).

3. A bath venturi jet unit as claimed in claim 2, wherein the ball type jet is operable to direct water discharged from the jet in a downward direction when the venturi jet unit is mounted on a bath side wall.

4. A bath venturi jet unit (70) as claimed in claim 2 or claim 3, wherein an outlet end (114) of the jet (73) is movable between a raised position and a lowered position by pivoting the ball end (110) of the jet (73) within the socket (111).

5. A bath venturi jet unit (70) as claimed in claim 4, wherein in the lowered position, a bore (115) of the jet (73) is substantially co-axial with a bore of the venturi throat (85).

6. A bath venturi jet unit (70) as claimed in any of claims 2 to 5, wherein one or more air inlet slots (116) are provided in a side wall of the ball end (110) of the jet (73), said ball end (110) of the jet (73) being rotatable within the socket (111) for positioning said slot (116) or slots into and out of communication with the air duct outlet (91).

7. A bath venturi jet unit (70) as claimed in claim 6, wherein a segment of the ball (110) is cut away to provide an air inlet slot (116) for the jet (73).

8. A bath venturi jet unit (70) as claimed in claim 6, wherein a plurality of spaced-apart radial slots are provided around portion of a side wall of the ball end (110) of the jet (73).

9. A bath venturi jet unit (70) as claimed in any of claims 2 to 8, wherein the ball type jet (73) is a snap fit in the socket (111).

10. A bath venturi jet unit (70) as claimed in any preceding claim, wherein the air duct outlet (91) is located adjacent an outlet end of the venturi throat (85).

11. A bath venturi jet unit (70) as claimed in any preceding claim, wherein a non-return valve (94, 96) is provided in the air duct (88) between the air inlet (90) and the air outlet (91) to prevent backflow of fluids through the air duct (88) from the air outlet (91) to the air inlet (90).

12. A bath venturi jet unit (70) as claimed in any preceding claim, wherein the elongate bore (80, 85, 86) is oriented within the main body (72) such that when the venturi jet unit (73) is mounted on a bath side wall, the bore slopes downwardly between the water inlet (80) and the water outlet (86).

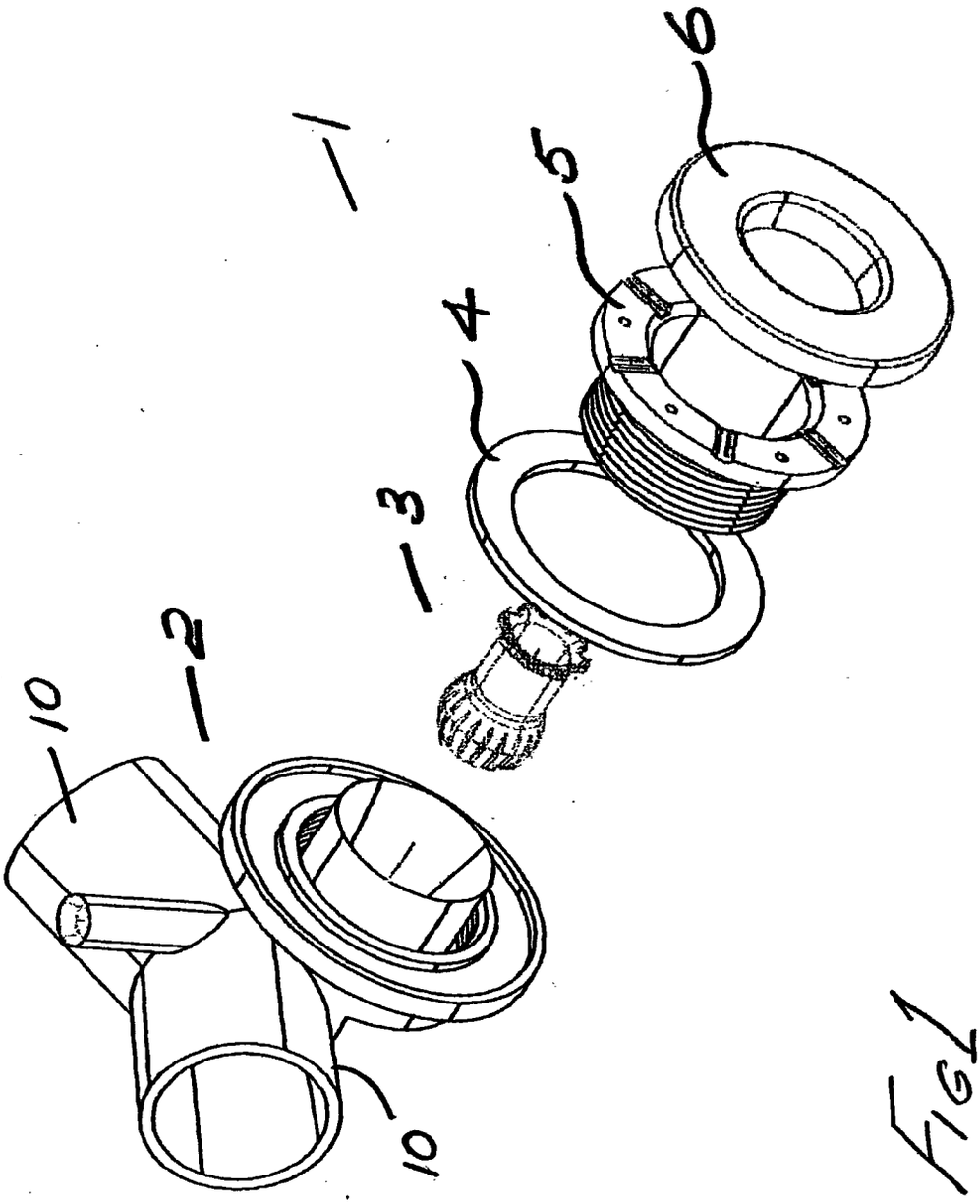

FIG 1

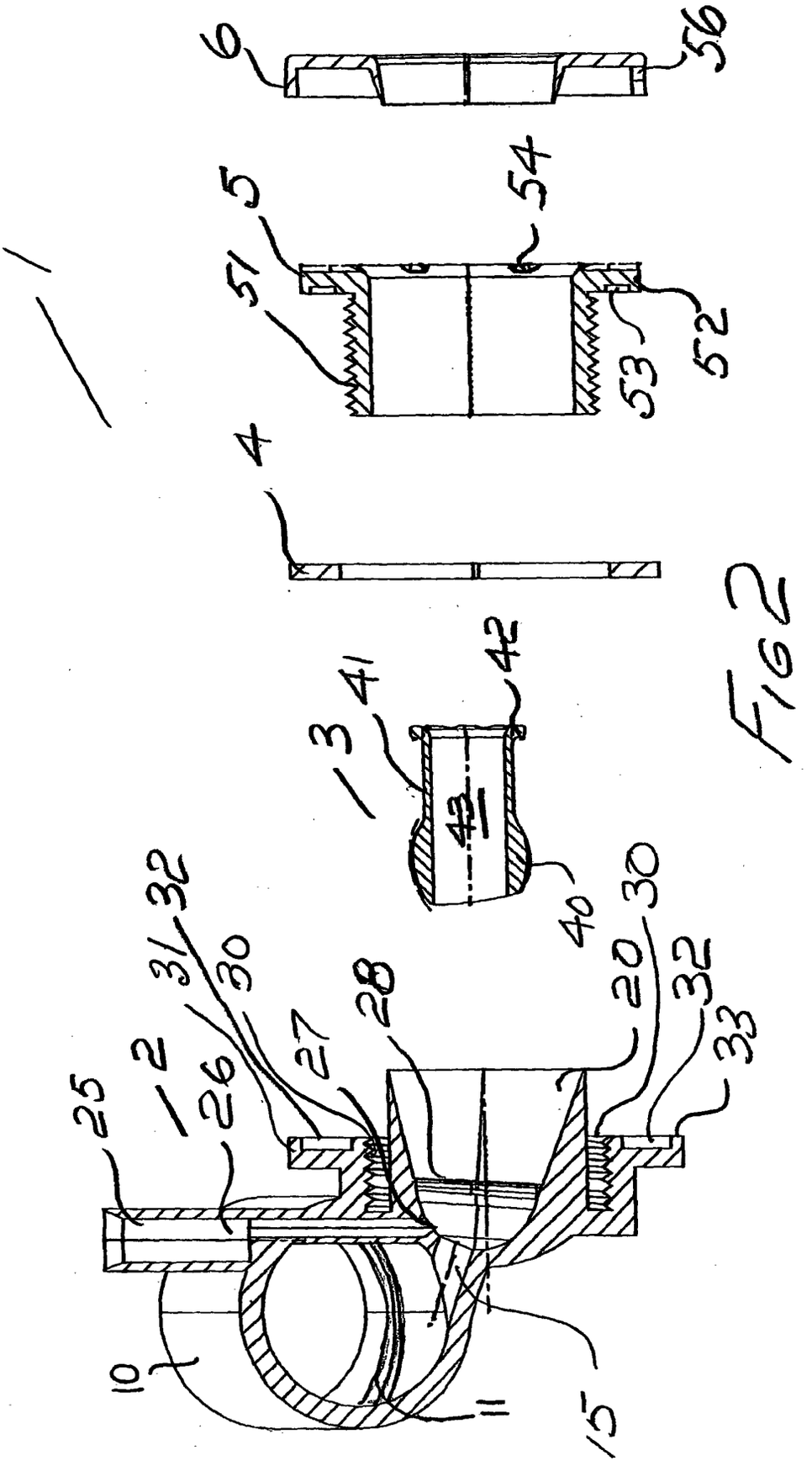
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FIG 2

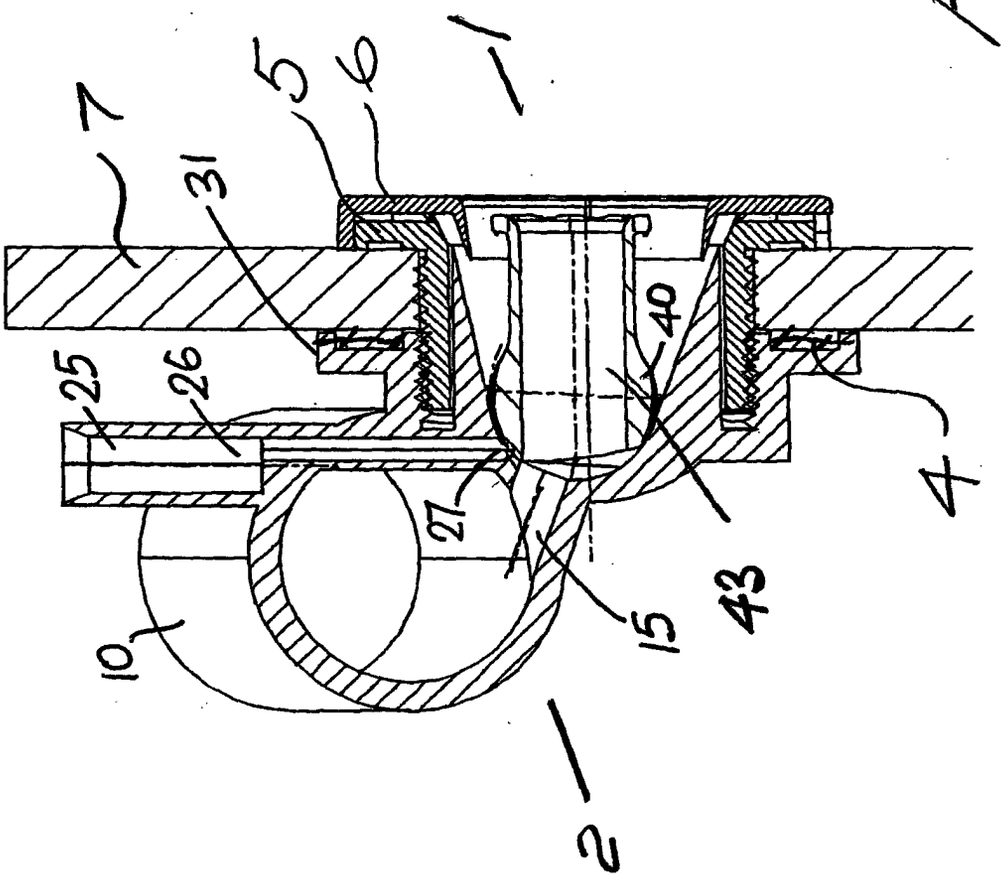

FIG 3

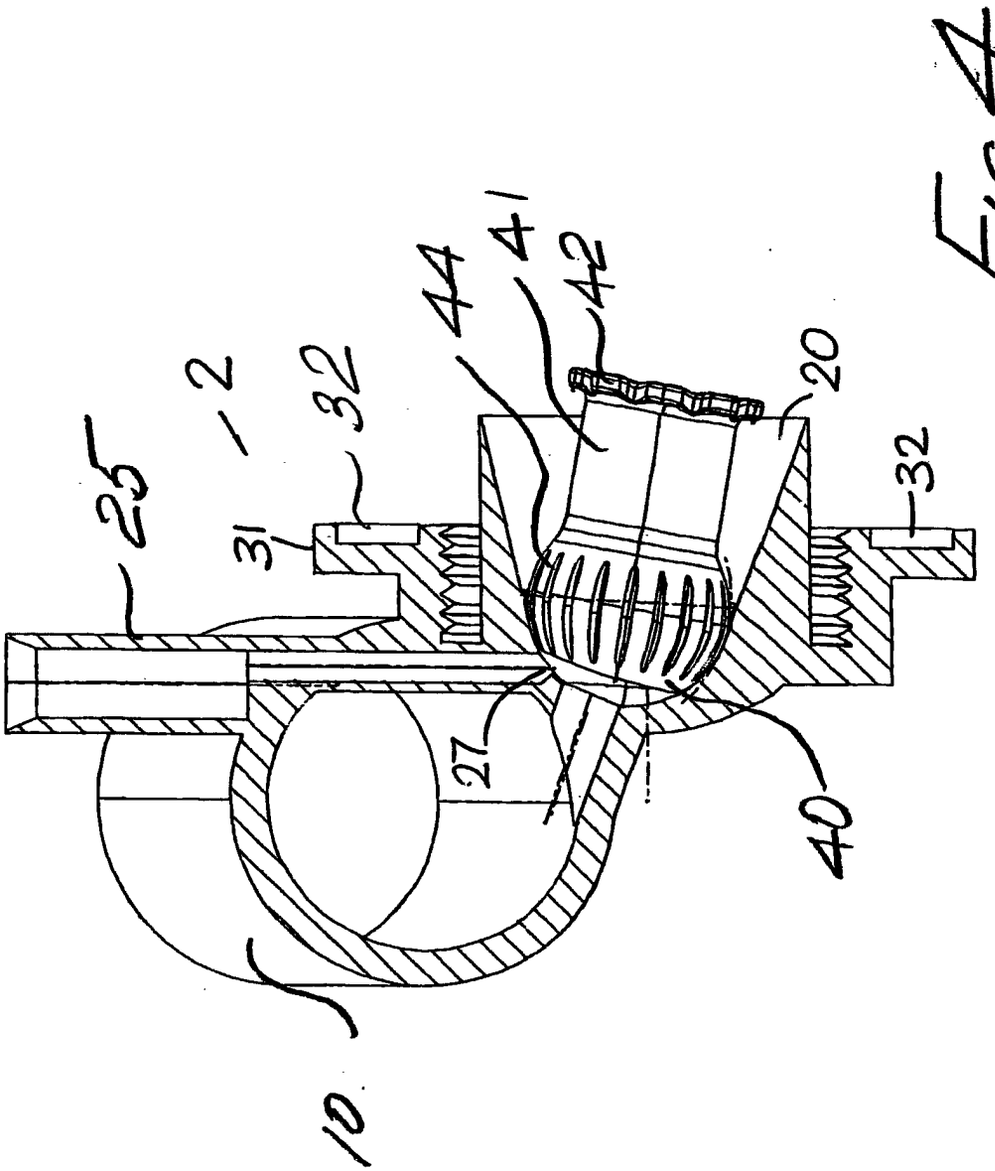

FIG 4

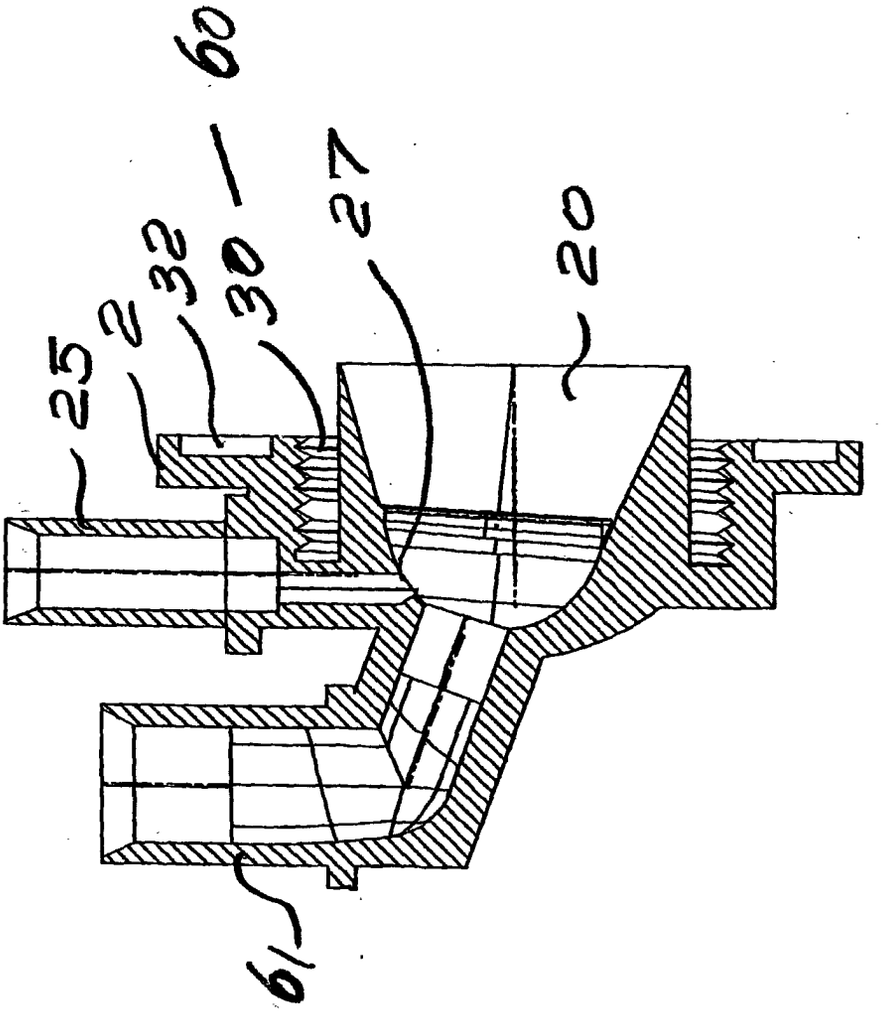

Fig 5

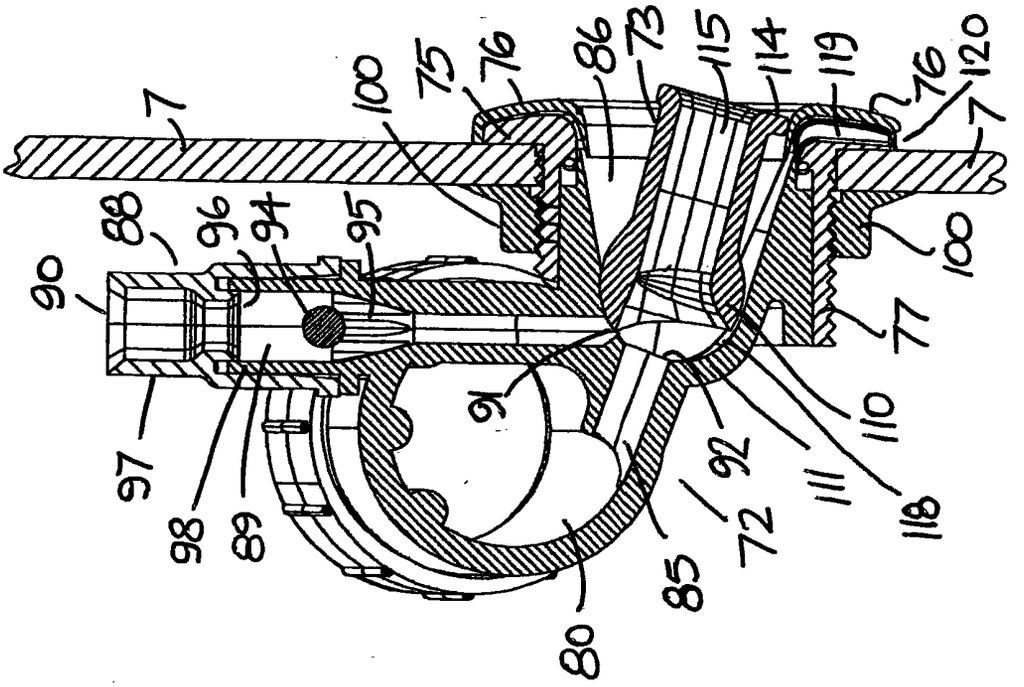
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FIG 7

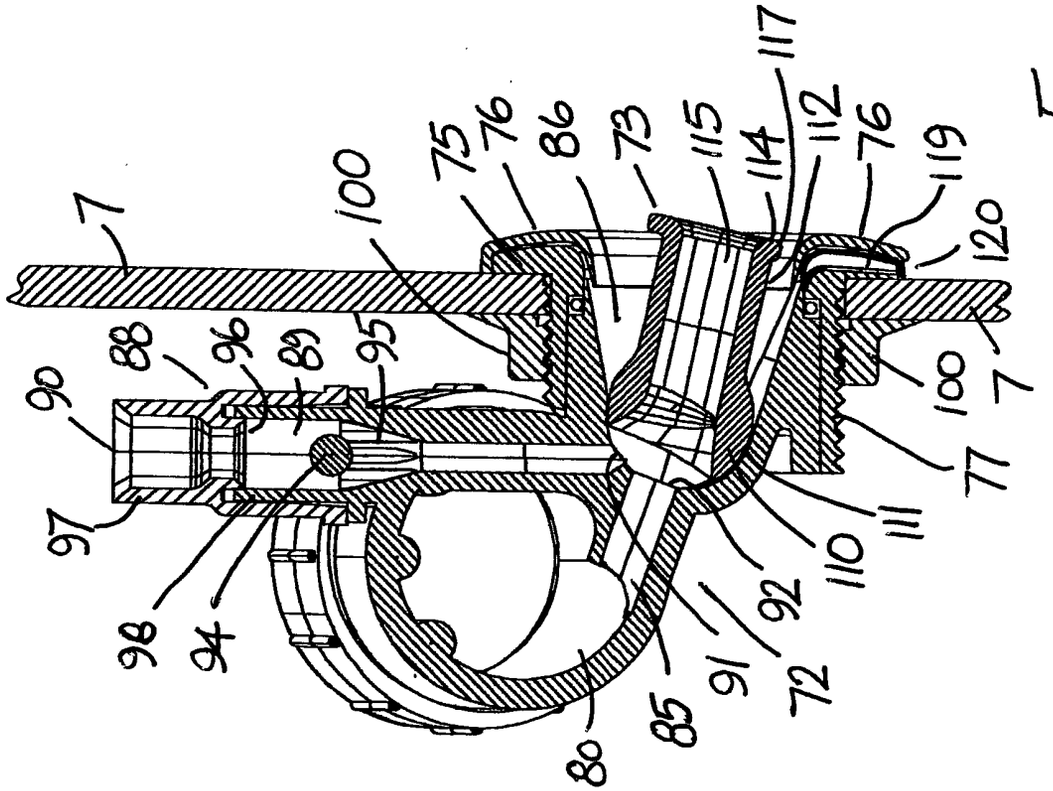
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FIG 6

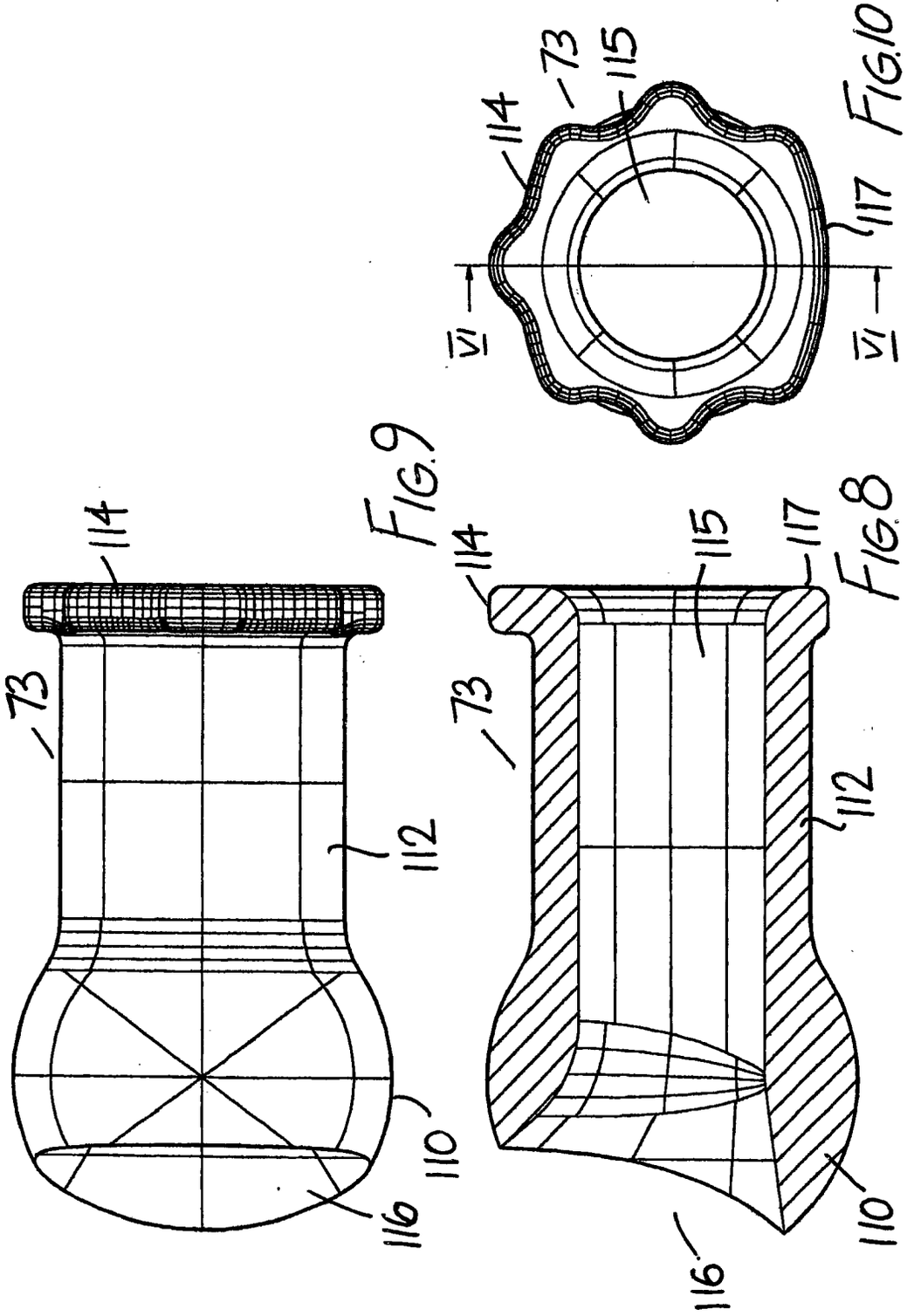

FIG.10

FIG.9

FIG.8

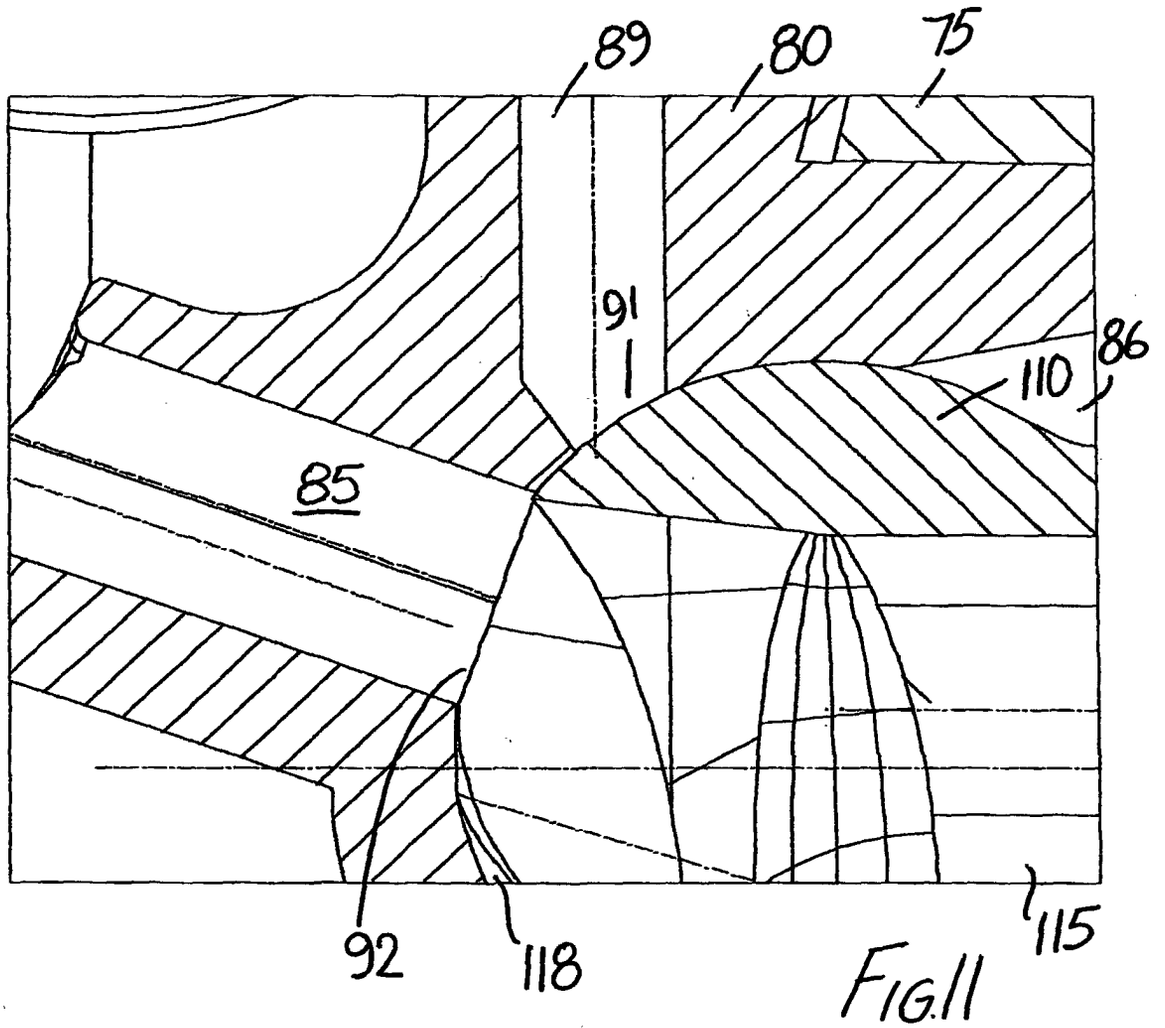

FIG.11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 65 0004

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Place of search	Date of completion of the search	Examiner
MUNICH	8 May 2001	Georgiou, Z

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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