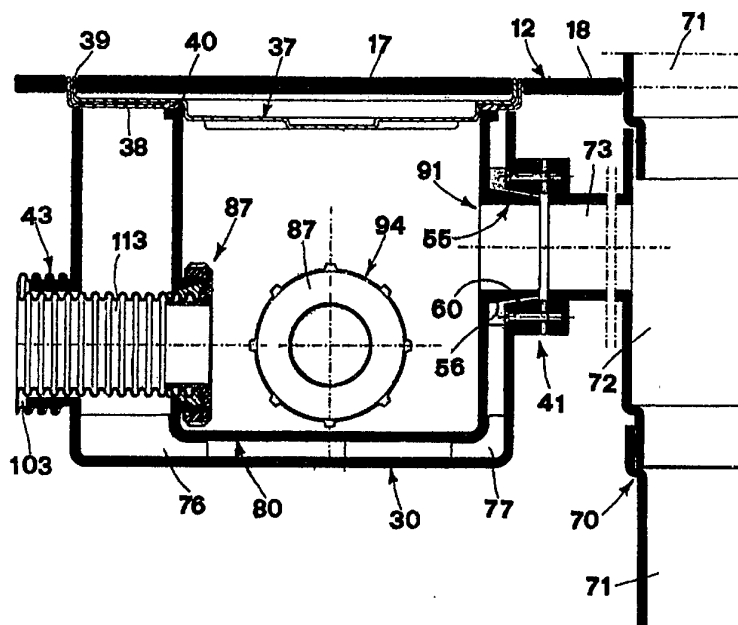




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(54) Title: DRAINAGE SYSTEM FOR WASTE WATER IN BUILDINGS, SEPARATED INTO TWO PARTS, A FIXED OUTER ONE AND AN INNER REPLACEABLE ONE

**(57) Abstract**

Drainage system for waste water from buildings with box shaped traps (30, 80) for distribution and drainage connected to the items of sanitary equipment and to the lavatory bowl drain pipe (70) by flexible piping (103, 113) with helical walls, separated into two systems, a basic system definitively installed within the building structure and another inside the first one, said second system being replaceable and shaped the same as the first one.

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DRAINAGE SYSTEM FOR WASTE WATER IN BUILDINGS, SEPARATED INTO TWO PARTS, A FIXED OUTER ONE AND AN INNER REPLACE-
ABLE ONE

Drainage systems in civil or industrial buildings are
5 known to be constructed of piping of synthetic material
run along inside walls and under floors.

If a break or blockage occurs in one part of the system,
walls or floors, even if in perfectly good condition,
must therefore be opened up for inspection, repairs or
10 replacement of parts

This interference with finished surface material, often
of a valuable kind, involves considerable expense over
replacement. Matching materials to avoid repair work
being noticeable may be a difficult matter. If marble,
15 stonework, wood or other expensive materials are concerned,
it may be almost impossible to find similar ones to main-
tain unaltered the characteristics of those first used.
Purpose of the present invention is to provide a drainage

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system for sewer water using piping as reliable as that at present in use, but so placed as to permit easy inspection, and replacement of damaged pipes were needed, without having to break into walls and flooring.

5 Subject of the invention is a drainage system for sewer water from civil and industrial buildings comprising box-shaped traps for connection to the lavatory bowl, distribution boxes for joining up the various parts, drain boxes for baths and showers, washbasins and bidets, and
10 piping to connect them all, created by separating the system into two distinct parts, one inside the other.

The external system is fixed, having been definitively installed within the structure of the building, and connects orifices - fitted with pipe unions - placed in the
15 structure to meet the drains leading off from the lavatory bowl and from other pieces of sanitary equipment.

The internal system is shaped like the external one, is placed inside it and it too is connected through orifices in the building structure and by means of special connections, to the lavatory bowl and to the other sanitary
20 equipment.

The internal system differs in size from the external one and contains fittings to facilitate its installation inside said external system and, where necessary, make possible its partial or complete removal, or replacement.
25

In the sides of the box traps are orifices, those in the fixed box trap being aligned with those in the internal replaceable box trap; they also have connections for piping and a cover flush with the surface of the building
30 structure; if required this may be sunk to allow space for a layer of finishing material similar to that of said structure.

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The piping, of synthetic material, is flexible and has helical undulations that form external and internal threading, pipes for the replaceable system being placed inside said fixed system.

- 5 Fittings on said traps, forming part of the fixed system, consist of external cylindrical pipe unions on the orifices, having external threading corresponding to the internal threading on the fixed pipes forming the fixed system to permit unions and pipes to be coupled together.
- 10 Connections to the traps in the replaceable system consist of pipe unions inside their orifices, internal taper converging on the inside, with external threading on the outside onto which a washer is to be screwed, said washer having a cylindrical axial body surrounded by a head in which
- 15 a cylindrical cavity is threaded with the same thread as that of the pipe unions.

Packing inside the pipe unions partially projects inwards in the box trap, its external taper corresponding to that of said orifices, and its internal diameter corresponding

20 to the external diameter of the piping forming part of the replaceable system.

It follows that by screwing on the washer said packing, forced inside the pipe union by the opposing tapers, holds the piping firmly against the axial body of the washer by

25 means of its thread, so making a stable connection.

Fittings on the orifices, in the building structure, forming part of the fixed system, consist of a cylindrical coupling whose external thread is the same as the internal thread on the fixed pipes; said coupling is to be placed

30 inside the structure and comprises a perforated head of greater diameter which makes contact with the external surface of said structure.

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The pipe is in this way fixed to said coupling by the thread.

The hole in the above head is larger than the maximum diameter of the piping in the replaceable system to allow said piping to emerge freely outside the building structure.

Alternatively the fittings on the orifices in the building structure of the fixed system consist of an internally threaded cylindrical coupling, said internal thread being the same as the external thread on the fixed piping; said coupling is placed inside the structure and is fitted with a flange that makes contact with the external surface of said structure.

In this way the fixed piping is connected to said coupling by means of its thread, while the piping in the replaceable system freely emerges from the building structure.

Pipe fittings for the sanitary equipment - bath, wash basin, bidet and others - consist of a coupling fixed to the drainpipe union of said sanitary equipment, having an external thread to receive a threaded lock ring and having one end whose external diameter corresponds to the smaller internal diameter of the piping in the replaceable system.

Inside said lock ring is a threaded hole by which said ring can be screwed onto the coupling; said hole ends in a flaired taper that houses packing with a corresponding taper on its outer surface, and an inner cylindrical hole whose diameter corresponds to the maximum diameter of the piping in the replaceable system.

The lock ring is externally threaded and to this is screwed a washer in which there is an axial hole through which the piping passes.

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Therefore, by screwing on said washer, the packing when forced inside the coupling, due to the opposing tapers, holds the piping firmly to the coupling and so makes a stable connection.

- 5 The fitting on the drain to the lavatory bowl consists of a ring nut whose internal thread corresponds to the external thread of the piping in the fixed system, with a flat flange to connect with the flooring, and of packing in which there is a hole whose diameter corresponds
- 10 to the external diameter of the drain pipe union for said lavatory bowl, the maximum external diameter being greater than the internal diameter of the flange, and with an internal axial helical annular groove corresponding to the dimensions and shape of the piping in
- 15 the replaceable system.

It is therefore possible to fix the piping in the fixed system by screwing its external thread onto the thread of the ring nut, and to fix the piping in the replaceable system by fitting its end into the helical groove

20 in said packing.

The lavatory bowl drain pipe comprises an original part in which there are orifices which have an external thread corresponding to the internal thread on the piping in the replaceable system.

- 25 Said piping can therefore be fixed by screwing the thread on the fitting into the internal thread of said piping. Said original part is connected to the upper part next to it by means of a concertina-type flexible connection so as to allow for any change of shape in the lavatory
- 30 bowl drain pipe, as well as to facilitate replacement of said original part.

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The drain traps for the bath or shower and for the other pieces of sanitary equipment have connections similar to those of the other box traps making connection possible, by means of two orifices, onto the drain pipe of the lavatory bowl and to the overflow pipe respectively, while plugs to holes in the sanitary fittings are worked by a tie rod inside the piping that connects said box trap to the overflow.

The advantages of the invention are clear.

10 The fixed external system assumes the form of a simple "sheath" or supporting structure for the replaceable system whose functions are equivalent to those of systems at present in use.

In the event of a breakage or blockage, not only is inspection made quick and easy, but also damaged parts, or even the whole internal system, can be replaced.

This can be done without any damage to wall or floor finishing material which in this way are not subjected to the slightest strain or stress.

20 In prefabricated buildings, the component parts of the fixed system in particular, can be installed during building.

The replaceable system can then be put in after the structural parts have been given their permanent positions.

All this means considerable savings should repairs become necessary, offering as well aesthetic advantages inconceivable with present systems, economy in overall costs since installations of the replaceable system, after masonry work has been completed, avoids damage and facilitates the work.

30 Characteristics and purposes of the invention will be made still clearer by the following examples of its execution illustrated by diagrammatically drawn figures.

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- Fig. 1 Perspective view of the drainage system for sewer water from a bathroom, according to the invention.
- Fig. 2 Longitudinal section of the box trap of the system with fitting to the drainpipe of the lavatory bowl.
- 5 Fig. 3 A partially cut away plan view of the box trap.
- Fig. 4 Detail of the box trap in Fig. 2.
- Fig. 5 Longitudinal section of a wall drain for a wash basin.
- Fig. 6 Longitudinal section of a lavatory bowl drain pipe in the wall from a flush tank above.
- 10 Fig. 7 Longitudinal section of the box trap for a bath tub.
- Fig. 8 Cut through plan view of the bath drain box trap.
- Fig. 9 Longitudinal section of the distribution trap.
- Fig. 10 Plan view of the distribution trap.
- Fig. 11 Longitudinal section of the drain from the lavatory bowl, and pipe union for said drain pipe.
- 15 Fig. 12 Cut through plan view of the lavatory bowl drain.

Drainage system for a bathroom 10 showing the floor 11 and wall 12, said system consisting of two parts, one fixed 15 permanently installed in the structure of the building, and

20 another replaceable 16 inside the fixed one.

The fixed system 15 comprises a parallelepiped box-shaped trap 30 with four orifices 31-34 one on each of its four sides, each orifice with pipe fittings 41-44 for connection to the lavatory drain 70 through piping 102-104 to the other

25 pieces of sanitary equipment 22-24.

Said box trap is closed by the cover 37 on the intermediate frame 38 and by screws 29.

The cover has a raised edge 39 flush with the floor 12.

In this way, by laying over said cover 37 finishing material 17, the same as the finish 18 on the floor 12, the

30 cover can be almost completely hidden.

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On the flexible pipes 102-104 are helical undulations and these create internal and external threading.

The pipe fitting 41 on the orifice 31 comprises a converging tapering pipe union 60 on which is a flange 61 with holes 62 passing through it.

- 5 The lavatory bowl drain 70 comprises superimposed parts 71 and a part 72 fitted with a pipe union 73 and flange 74. In said flange are threaded holes 75 aligned to the holes 62 in the flange 61, the two flanges being joined by screws 63 and packing 65.

- 10 Pipe fittings 42-44 comprise a cylindrical pipe union 35 with an external thread 36 corresponding to the internal thread on the pipes 102-104.

- The pipes 102-104 join the pipe fittings 42-44 respectively to the fitting 45 on the drain 140 for the bath 22 and
15 to the fittings 46 and 47 on the wall 12 of the bathroom 10. These wall fittings 46 and 47 have a cylindrical pipe union 120 fixed to the centre of the semispherical cap 122 whose external thread 121 corresponds to the internal thread on pipes 103 and 104 and whose internal diameter 123 corresponds to the external diameter of the pipe 113.

- 20 Wall fittings 50 and 51 are similar to fittings 46 and 47 and have a cylindrical pipe union 130 with external thread 131, mounted inside the wall 12 stably connectable to the collar 133 of the semispherical cap 132.

- 25 The axis of said collar passes through the centre of the cap 132, inclined in relation to its diametral plane at about 45°. By means of these fittings connection is made between the externally mounted flushing tank 26 and the lavatory bowl 25 by the fixed pipe 106, and between fittings 52 and 53 by the replaceable pipe 116.

30 Said fitting 53 comprises the packing 195 whose thread 196 corresponds to the thread on the pipe 116.

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The replaceable system 16 inside the fixed system 15 comprises the parallelepiped box trap 80 that can be fitted inside the fixed box trap 30 resting on the supporting ribs 76 and 77.

- 5 In the box trap 80 there are four orifices 81-84 corresponding to the orifices 31-34 in the fixed box trap 30 and four fittings 91-94; these connect to the lavatory bowl drain pipe 70 and, through pipes 112-114, to the other pieces of sanitary equipment 22-24.
- 10 Fitting 91 on the orifice 81 comprises a cylindrical pipe union 55 the taper of whose external wall 56 corresponds to the taper of the pipe union 60 on the box trap 30 and can make a watertight connection to said union 55 by means of the tapered packing 57 comprising a flange 58.
- 15 The fittings 92-94 comprise a diverging tapered pipe union 85 with a cylindrical external wall and thread 86, on which the washer 87 is screwed, the internal thread 88 of said washer corresponding to the thread 86 of the pipe union; said fittings also comprise an axial tubular body
- 20 89.

The external diameter of said body corresponds to the internal diameter of the pipes 112-114, to be placed inside the fixed pipes 102-104; though similar to said fixed pipes, external diameter of pipes 112-114 is smaller than the

25 internal diameter of the fixed pipes so that the former can be easily run inside the latter and replaced if this should become necessary.

Between the pipe union 85 and the washer 87 is packing 66; the internal wall 67 of said packing corresponds to

30 the external diameter of pipes 112-114 and its external wall 68 tapers to correspond with the taper of the pipe union 85.

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The framework 38 below the cover 37 corresponds to the space between the fixed box trap 30 and the replaceable one 80. Packing 40 is placed between the lid 37 and said replaceable trap 80.

5 Through the wall connection 46, the washbasin 23 is joined to the box trap by the pipe 113 and pipe fitting 48.

Said pipe fitting 48 comprises a coupling 170 and flange 171 to fit said coupling on the edge of the hole 28 in the wash basin, said flange having an external thread 172 onto
10 which the ring nut 175, with internal thread 176, is screwed. Said ring nut 175 has an internal tapering connection 178 and a second external thread 177 on the free end.

Inside said tapered connection is a packing 180, tapered externally, through which is an axial hole to allow the
15 pipe 113 to pass.

The washer 181 is screwed onto the thread 177, said washer having through it an axial hole to allow passage of the pipe 113, and an internal thread 182.

Screwing pressure by the washer and opposing tapered surfaces cause the packing to contract and thus maintain a
20 hold on the pipe 113 pressed between said packing and the coupling 170.

The fitting 52 under the flushing tank 26 comprises the pipe union 190, ring nut 191, washer 192, packing 193 all
25 substantially the same as the coupling 170, ring nut 175, washer 181 and packing 180 of fitting 51 already described..

Fitting 53 on the lavatory bowl 25 for water from the flushing tank 26 comprises the pipe union 27 for said lavatory bowl, packing 195, whose internal thread 196 corresponds
30 to the external thread on pipe 116, and locking flange 198.

The fixed trap 140 for the bath 22 has opposite orifices 141 and 142 with pipe fittings 45 and 54 similar to the

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fittings 42 and 44 previously described.

Fixed pipe 105 connects fitting 54 to overflow 153³ through fitting 55.

Inside the box trap 140 is the replaceable box trap 150
5 held in place by screws 153 that screw onto the threads 154 present at the bottom of the fixed trap 140.

In said replaceable trap 150 are orifices 151 and 152 aligned with the orifices 141 and 142 in the fixed trap 140, said orifices having fittings 56 and 57 similar to
10 those, 42-44, already described for the replaceable pipes 112 and 115.

As figures 7 and 8 show, in the hole 28 at the bottom of the bath 22 is a trap 155 comprising an upper flange 156 that fits against the edge of the drain hole 28 in the
15 bath 22, and the column 157 with lower head-pin 158 inserted in the seat 159 at the bottom of the trap 150.

The column 157 supports the pin 160 of the bath plug 161 and the device 162 for working said plug by means of a tie rod 163 placed inside the replaceable pipe 115 and
20 connected to the overflow 153.

To connect up with other parts, pairs of box traps like those indicated by numbers 220 and 230 in Figures 9 and 10, can be included in the system 10.

The main features of said box traps are the same as those
25 of the pair of box traps, namely the fixed one 30 and the replaceable one 80, already described.

The orifices 221-224, pipe fittings 225-228 and cover 239 over the trap 220 forming part of the fixed system, can be seen, as well as the orifices 231-234 and pipe fittings
30 235-238 for the replaceable trap 230 similar to the orifices 31-34 and 81-84 and to pipe fittings 41-44 already

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described. Connections are made by pipes 108 and 118 similar to those described above. The figures show the cover 239 flush with the level of the floor 12. Connection between the lavatory drain pipe 70 and lavatory bowl itself 25, can be made through the fixed pipe 107 that joins the fixed horizontal fitting 200 to the vertical fitting 201 under the floor 12 (Figs. 11, 12). Said fittings have a washer 202 with internal thread 203 corresponding to the external thread on pipe 107, and with a flange 204 adhering to the vertical structure 13 and to the floor 12 respectively. The lavatory bowl pipe 70 includes the special part 205 which has four orifices 206 with pipe unions 207 whose external thread 208 corresponds to the internal thread of the pipes 117.

Said pipes 117 are connected to pipe unions 206 by annular packing 213 and metal clips 214.

Said special part 205 is connected to the upper part 72 and to the vertical pipe union 76 by a concertina-type of flexible coupling 209 held in place by metal clips 215.

The replaceable pipe 117, similar to pipes 112-114 referred to earlier, connects a pipe union 206 to a pipe union 27 on the lavatory bowl 25 by packing 210. Cross section of said packing is trapezoidal with a hole 211 in it whose position corresponds to that of the inner wall of the union 27 of lavatory bowl 25, and an inner helical groove 212 onto which pipe 117 is screwed, as seen in Fig. 11. Flexible coupling 209 absorbs any movement by the lavatory drain pipe so that special part 205 can be replaced.

Clearly, therefore, the whole system 16 can be replaced as the replaceable box traps can be lifted out from the fixed ones by simply taking off the covers, and since the connecting pipes can be pulled out completely and easily.

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CLAIMS

1. Drainage system (15,16) for waste water in civil and industrial buildings with connections to the sanitary equipment (22-25) and to the lavatory bowl drain trap(70),
5 comprising box-shaped traps (30,80), distribution traps (220,230) and drains (149,150) for the bath (22), shower and the like, and connecting pipes (102-108, 112-118); characterized in that the system is separated into two parts, one inside the other, one system, the first (15),
10 comprising box traps (30) and distribution traps (220), drain pipes (140) and water pipes (102-106,108), these being fixed, namely definitively installed in the structure of the building (11,12), connecting up fittings (46, 47,50,51,200,201) for the pipes (102-108) laid inside
15 said building structure (11,12) at the point of the lavatory bowl drain (70) and of the drain pipes for the sanitary equipment (22-25), and the second system (16), also comprising box traps (80), distribution traps (230), drain traps (150) and water pipes (112-118) shaped similarly to
20 the first set (15) inside which they are placed, connecting up, by orifices and pipe fittings (46,47,50,51,200,201) in the building structure (11,12), the sanitary equipment 22-25) and the lavatory bowl drain (70), said second system (16) being of a different size compared with the first
25 one (15) and having locking parts to permit easy installation inside the first system (15) and, in the event of breakages, quick and easy removal and replacement of part or all of said second system, said box traps, whether of the outer fixed or inner replaceable system, having orifices
30 in their sides, the orifices (31-34, 141,142,221-224) in the fixed box-traps (30,140,220) being aligned with the orifices (81,84,151,152,231-234) in the internal replaceable

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box traps (80,150,230), having fittings (41-44,45,54, 225-228 and 91-94,56,57,235-238) for the pipes (102-108, 112-118) and covers (37,239) that lie flush with the external plane of the building structure (11, 12), if necessary being sunk to allow space for a layer of top finishing material (17) the same as that (18) already used.

2. System (15,16) as in claim 1, characterized in that the pipes (102-108, 112-118) are made of flexible synthetic material with helical undulations that create external and internal threading, the pipes (112-118) of the replaceable system (16) being situated inside the pipes (102-108) of the fixed system (15).

3. System as in claims 1 and 2, characterized in that the fittings (41-44, 45,54,225-228) on the box traps (30,140,220) of the fixed system (15) consist of cylindrical unions (35) external to their orifices (31-34, 141, 142,221-224) and have external threading (36) corresponding to the internal threading on the fixed pipes (102-108) in the fixed system (15) so that they can be fitted together by inserting the thread on the unions (35) into that on the pipes (102-108).

4. System as in claims 1 and 2, characterized in that the fittings (91-94,56,57,235-238) on the box traps (80,150,230) in the replaceable system(16) consist of internal pipe unions (85) in their orifices (81-84,151,152,231-234) whose internal taper diverges towards the inside and on whose external thread (86) a washer (87) is fitted, said washer having an axial cylindrical body (89) surrounded by a head in which there is a cylindrical cavity with a thread (88) corresponding to that on the pipe unions (85), the external diameter of said body (89)

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corresponding to the lesser diameter of the pipes (112-118) forming part of the replaceable system (16), there being inside the pipe unions (85) a packing (66) partially projecting towards the inside of the box trap (80,150,230),
5 the external taper (68) of said packing corresponding to that of said pipe unions (85) and whose diameter corresponds to the external diameter of the pipes (112-118) forming part of the replaceable system (16), so that by screwing on the washer (87), said packing(66), forced in-
10 side the union (85) due to opposing tapers, presses the pipe (112-118) against the axial body of the washer (87) fitting onto its thread (88) and making a stable connection.

5. System as in claims 1 and 2,
15 characterized in that the fittings (46,47,50,51,200,201) on the orifices, in the building structure (11,12), forming part of the fixed system (15) consist of a cylindrical coupling (120) whose external thread (121) corresponds to the internal thread of the fixed pipes (102-108), to be
20 mounted inside the structure (11,12), said coupling having a perforated head (122) of a greater diameter which makes contact with the external surface of said structure(11,12) while the thread on the piping (102-108) connects with said coupling (120), the hole in the head (122) being lar-
25 ger than the maximum diameter of the piping (102-108) in the replaceable system (16) to allow said piping (102-108) to emerge freely from the building structure (11,12).

6. System as in claims 1 and 2,
characterized in that the fittings (200,201) on the orifi-
30 ces, on the building structure, of the fixed system (15), consist of a cylindrical coupling (202) whose inner thread-
(203) is the same as the external thread on the fixed

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5 piping (107) to be placed inside the structure (12), said coupling having a flange (204) that makes contact on the external surface of said structure (12) so that, by means of its thread, said fixed pipe (107) connects with said coupling (202) while the pipe (117) forming part of the replaceable system can freely emerge from the building structure (12).

7. System as in claims 1 and 2, characterized in that the fittings on the pieces of sanitary equipment such as wash basin (23), bidet (24) and the others, consist of a coupling (170) fixed to the union on the drain pipe from the lavatory bowl (23), said coupling having an external thread (172) to receive a lock nut (175) and having one end whose external diameter corresponds to the lesser diameter of the piping (113) forming part of the replaceable system (16), said lock nut (175) having an internal hole (176) threaded to receive the coupling (170), said hole (176) ending in a flaired taper (178) that receives packing (180) with a corresponding taper (167) on its external wall and an internal cylindrical hole whose diameter corresponds to the maximum diameter of the piping (113) in the replaceable system (16), said lock nut (175) having an external thread (177) onto which a washer (181) is screwed, said washer having an axial hole in it for passage of the piping (113) so that by screwing on said washer (181), the packing (180) when forced against the coupling (170) due to opposing tapers (167, 178), presses the piping (113) against the coupling (170) and so makes a stable connection.
8. System as in claims 1 and 2, characterized in that the drain fitting on the lavatory bowl (25) comprises a ring nut (202) whose internal thread (203)

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corresponds to the external thread on the pipe (107) forming part of the fixed system (15), said ring nut having a flat flange (204) that makes contact with the floor (12), and comprises packing (210), the diameter of whose internal hole (211) corresponds to the external diameter of the union (27) on the drain of said lavatory bowl (25), and whose maximum external diameter is greater than the internal diameter of the flange (204), with an axial internal helical annular groove (212) corresponding to the dimensions and shape of the piping (117) forming part of the replaceable system (16), so that the piping (107) in the fixed system (15) can be joined by inserting its external thread into that of the ring nut (202), while the piping (117) in the replaceable system (16) can be joined by inserting its end into the helical groove (212) in said packing (210).

9. System as in claims 1 and 2, characterized in that the drain pipe (70) for the lavatory bowl comprises an original part (205) fitted with orifices (206) and pipe union (207) with an external thread (208) corresponding to the internal thread of the piping (117) forming part of the replaceable system (16) so that said piping (117) can be joined on by inserting the thread of the pipe union (207) into the internal thread of said piping (117), said original part (205) being connected to the part immediately above it (72) by a concertina-type flexible coupling (209) for the purpose of absorbing any change in shape there may be in the lavatory bowl drain pipe (70) and also for facilitating replacement of the original part (205).

10. System as in claims 1 and 2, characterized in that the box trap (30) in the fixed system (15)

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is connected to a pipe union (73), with flange (74), on the lavatory bowl drain pipe (70) by means of an orifice (31) with a converging internally tapered union (60) fitted with a flange (61) connected to the opposing flange (74) on the pipe union (73) for the above drain pipe (70) by screws (63), while the box trap (80) forming part of the replaceable system (16), inside the first box trap (30), is connected to the tapered union (60) on the orifice (31) in the box trap (30), forming part of the fixed system (15), by means of a pipe union (55) with an external taper (56) corresponding to the internal taper of the union (60) on the box trap (30) in the fixed system (15), thus causing reciprocal matching of the opposing tapers with intermission of packing (57) having both an external and an internal taper and a flat annular base.

11. System as in claims 1 and 2, characterized in that the technical features of the out-flow drain (140) to the bath (22) are similar to those of the box trap (30) and distribution trap (220), making possible by means of two orifices (221) and (223) connection to the lavatory bowl drain pipe (70) and to the overflow (153) respectively, while the drain plug device (161), if applied, to the drain from the bath (22) is operated by a tie rod (163) that passes inside the pipe (115) that connects a box trap (150) inside the box trap (140) to the overflow (153).

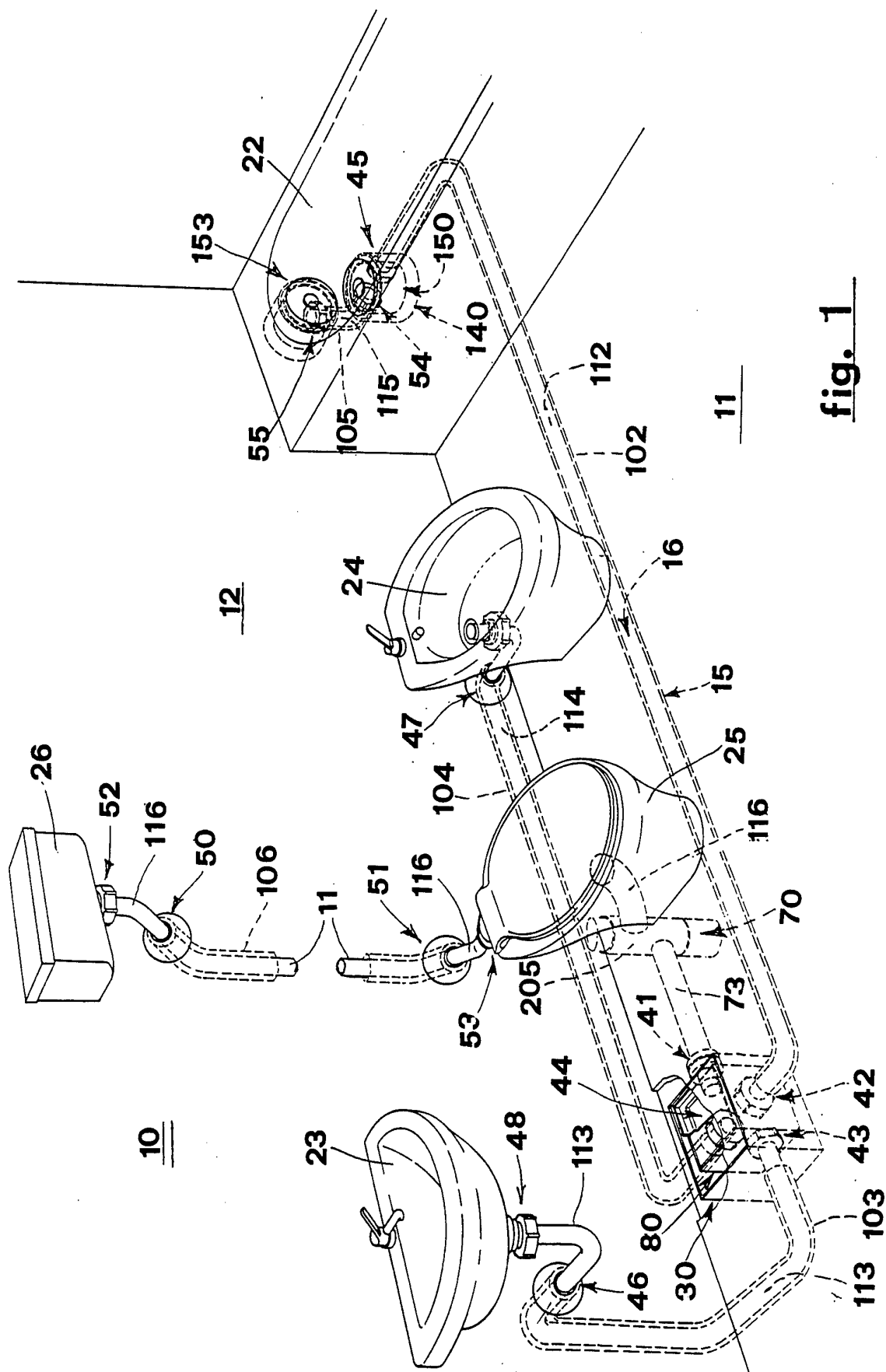


fig. 1

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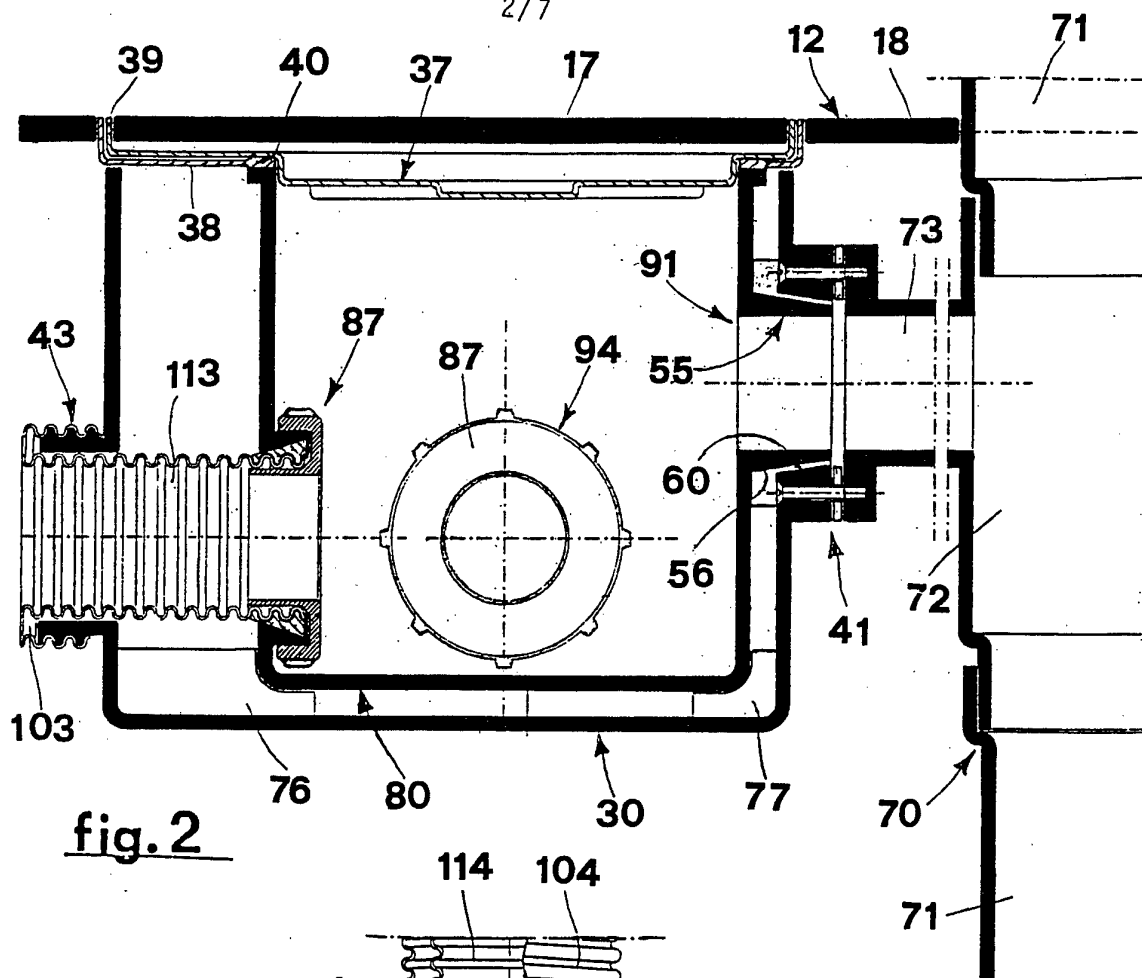


fig. 2

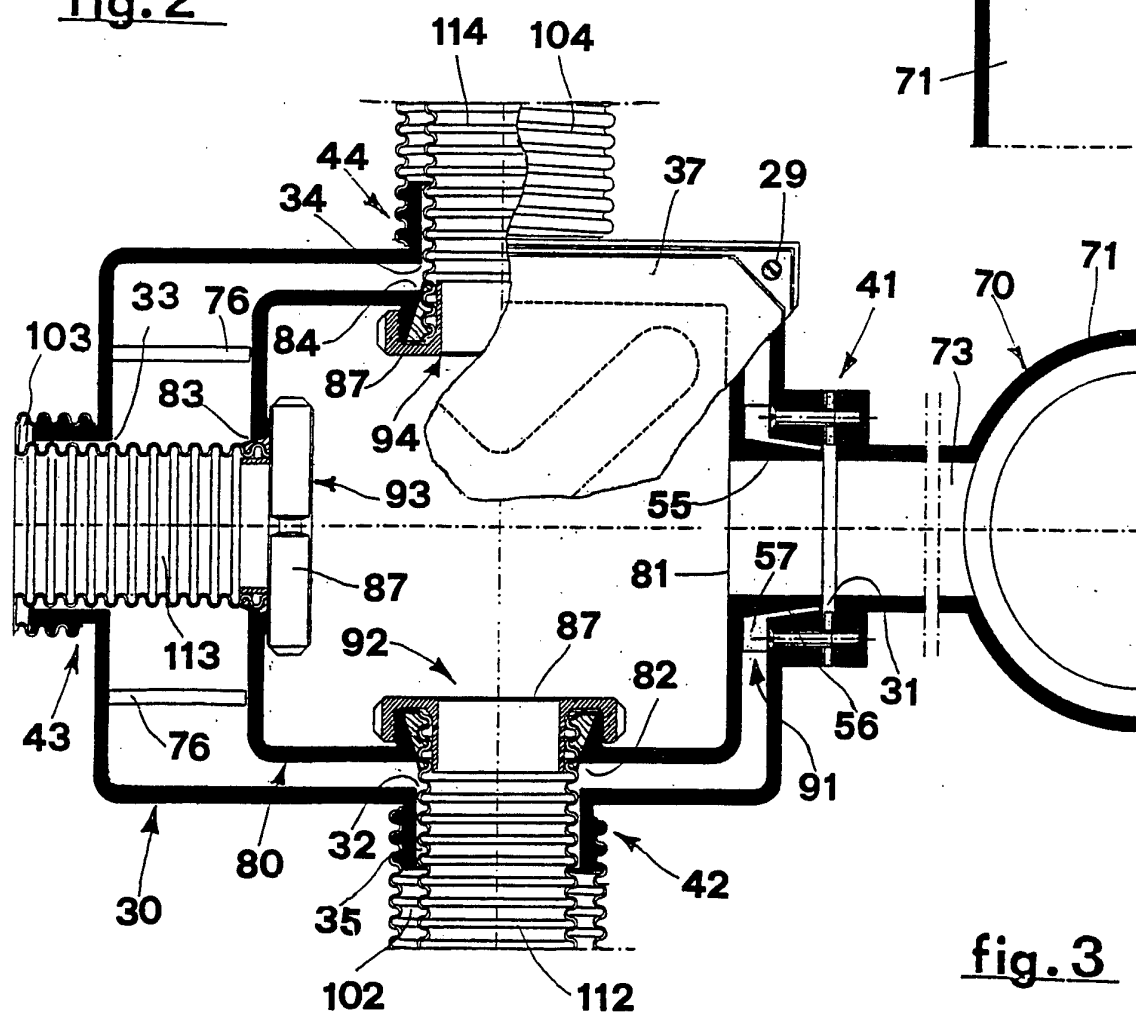


fig. 3

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fig. 5

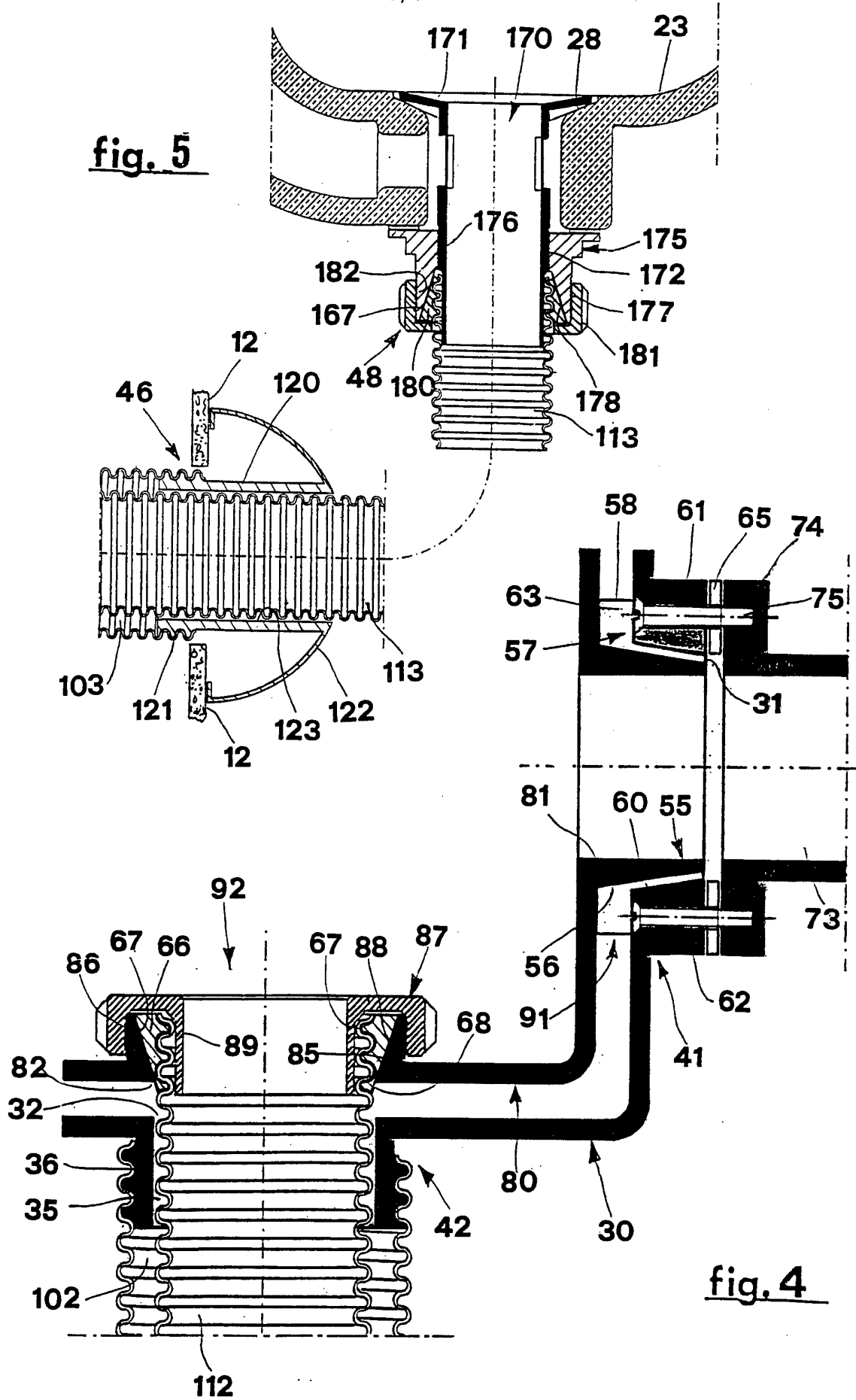


fig. 4

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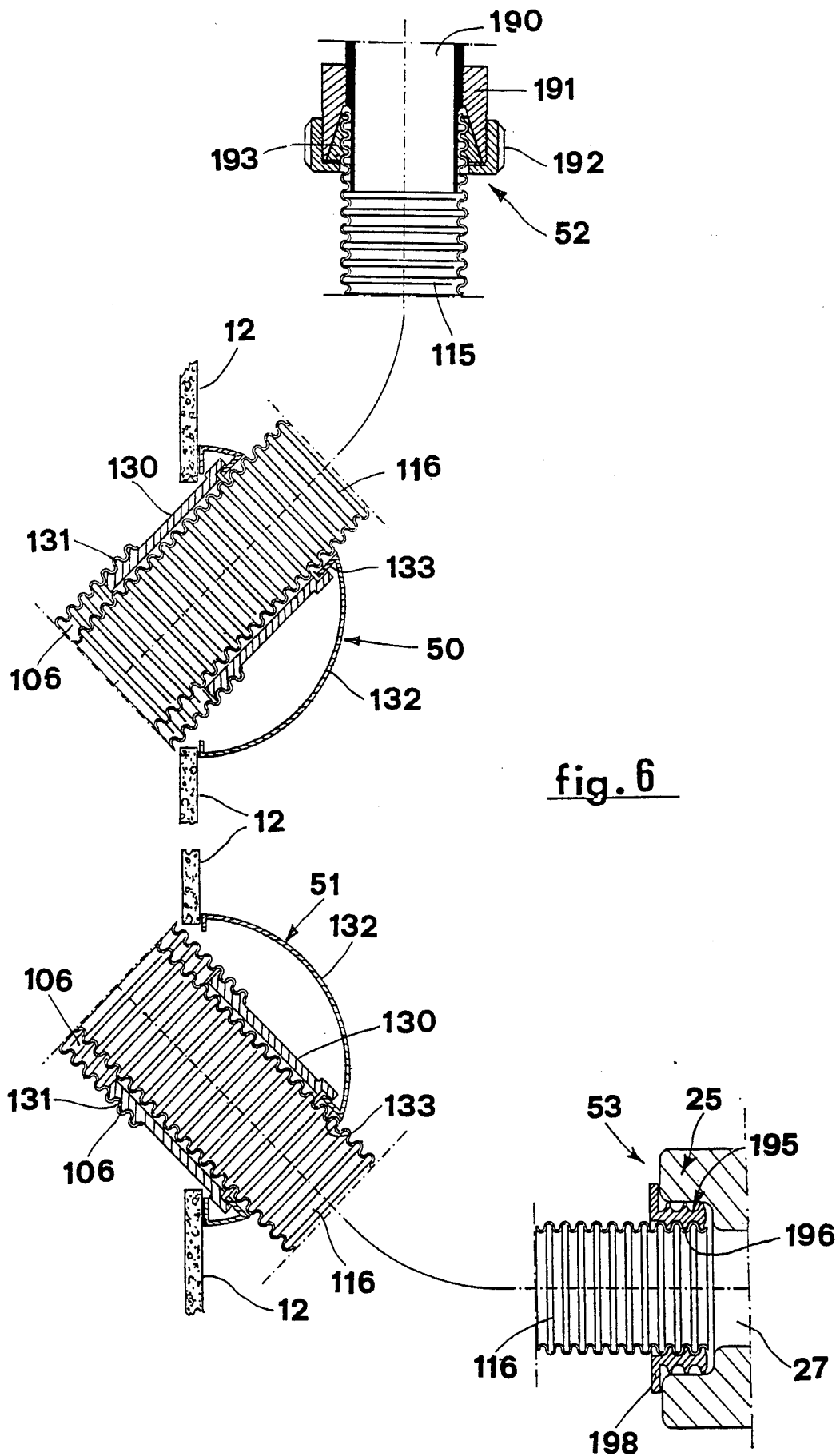


fig. 6

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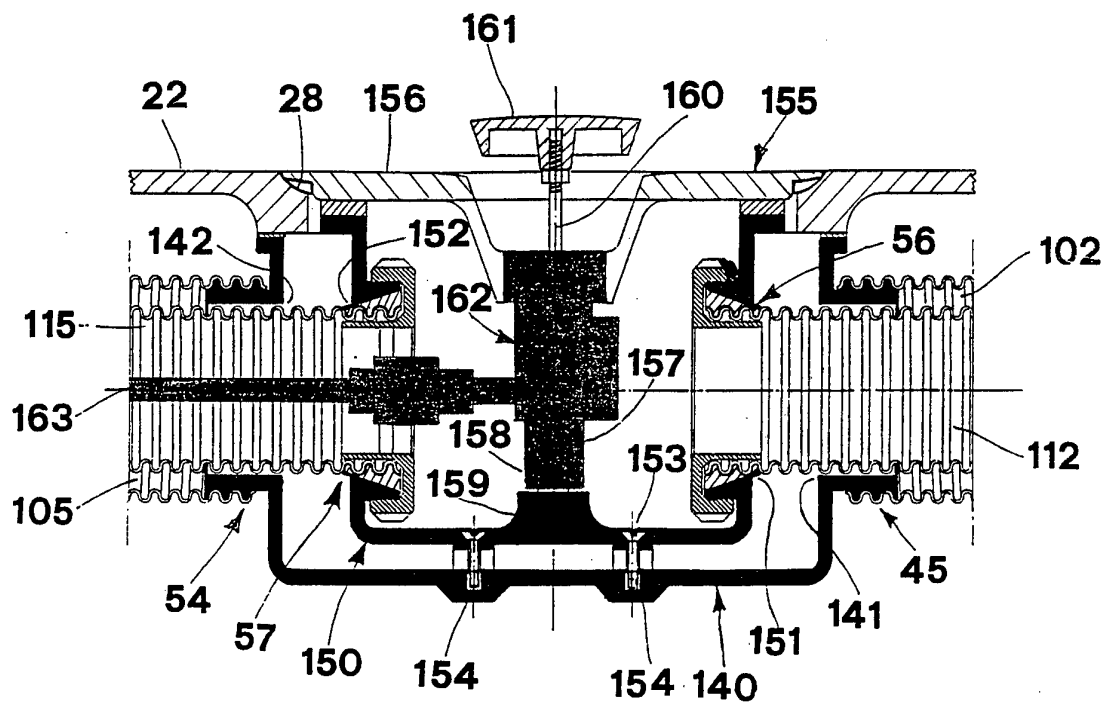


fig. 7

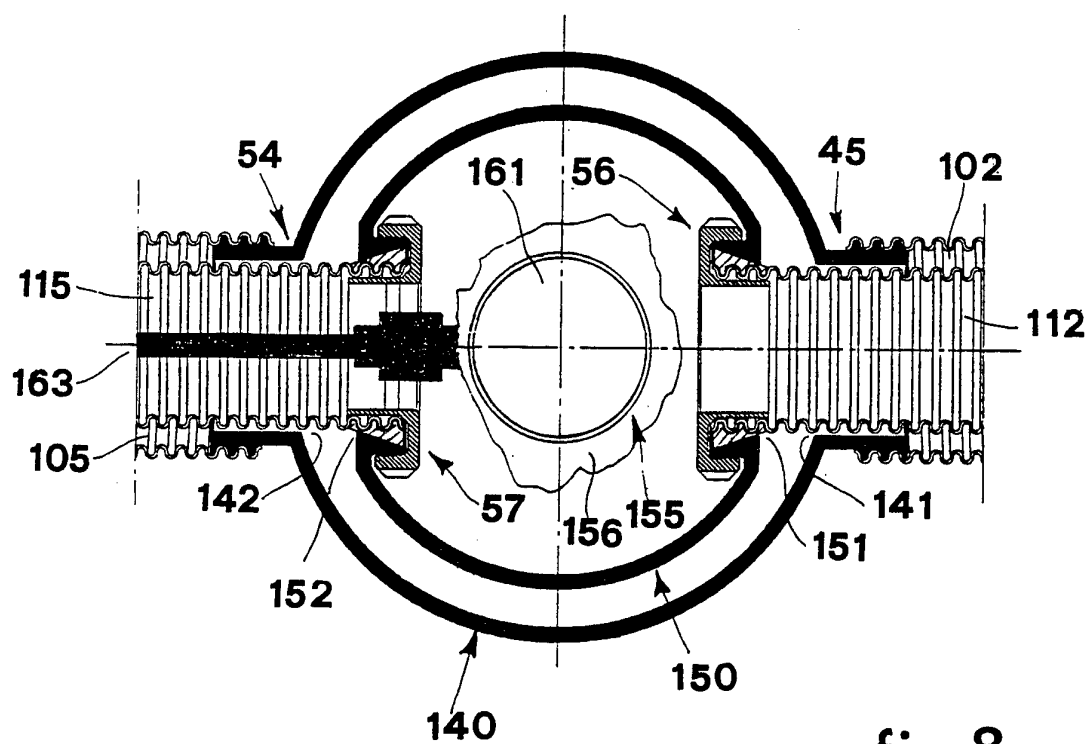


fig.8

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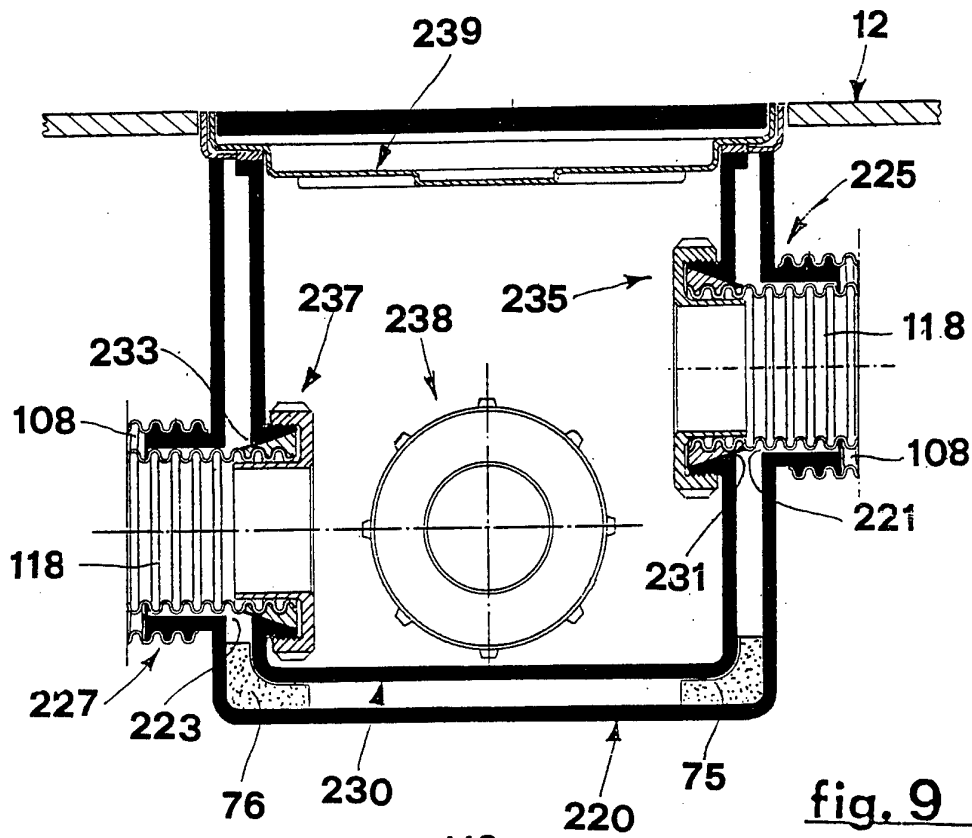


fig. 9

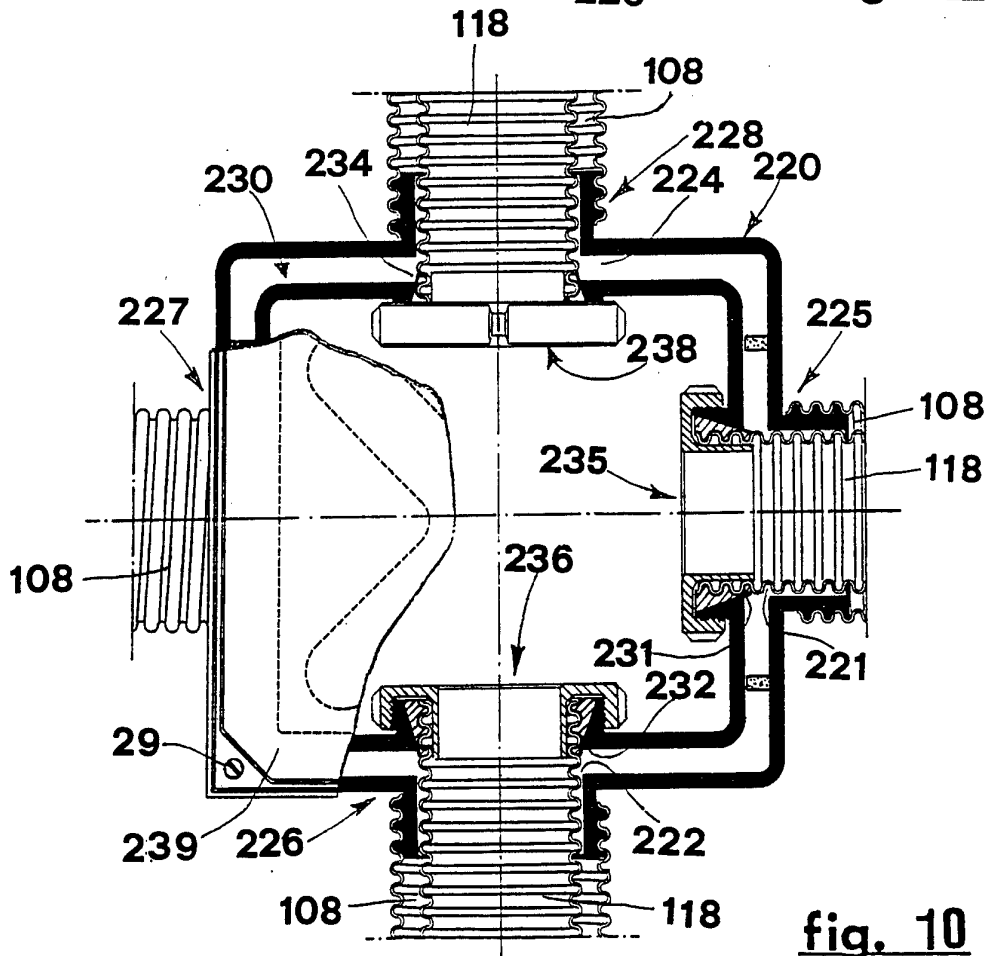


fig. 10

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 94/00066

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E03C1/122

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)
IPC 6 E03C 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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB,A,1 282 325 (AB GUSTAVSBERGS FABRIKER) 19 July 1972 see page 2, line 82 - line 100; figures 1,3	1
A	EP,A,0 191 309 (J.+R. GUNZENHAUSER AG) 20 August 1986 see the whole document	1
A	DE,A,26 08 015 (JOSAM MANUFACTURING CO.) 1 September 1977	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
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- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

20 September 1994

Date of mailing of the international search report

7.10.94

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Fax (+ 31-70) 340-3016

Authorized officer

De Coene, P

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IT 94/00066

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A-1282325	19-07-72	NONE	
EP-A-0191309	20-08-86	DE-A- 3660113	05-05-88
DE-A-2608015	01-09-77	NONE	