

(19)



(11)

EP 4 000 747 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
25.05.2022 Bulletin 2022/21

(51) International Patent Classification (IPC):
B05B 15/658 ^(2018.01) **B05B 7/04** ^(2006.01)

(21) Application number: **21209201.9**

(52) Cooperative Patent Classification (CPC):
B05B 15/658; B05B 7/0416

(22) Date of filing: **19.11.2021**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **PNR Italia S.r.l.**
27058 Voghera (IT)

(72) Inventor: **TONINI, Federico**
6826 RIVA SAN VITALE (CH)

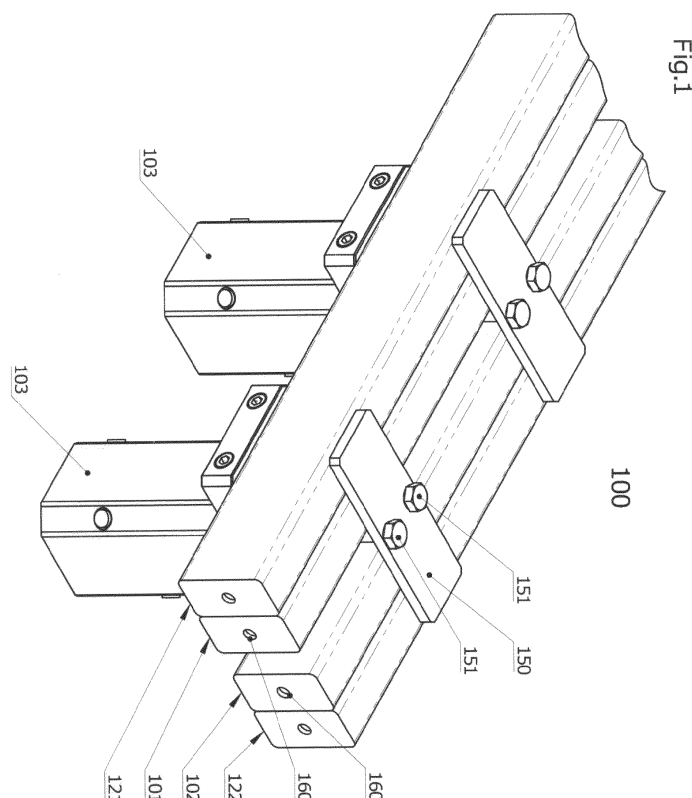
(74) Representative: **Torti, Carlo Maria Emilio et al**
Notarbartolo & Gervasi S.p.A.
Viale Achille Papa, 30
20149 Milano (IT)

(30) Priority: **20.11.2020 IT 202000027885**
20.11.2020 IT 202000006441 U

(54) **CONNECTING MANIFOLD ELEMENT FOR SYSTEMS AND/OR SYSTEMS FOR DISPENSING ATOMIZED LIQUIDS**

(57) A connecting manifold element (100) comprising a first tubular element (101) and a second tubular element (102) extending each between a first end thereof and a second end thereof, where at least the respective first ends of said first tubular element (101) and second

tubular element (102) are adapted to be connected to a first main supply duct and a second main supply duct, respectively, so as to intercept a first fluid and a second fluid, respectively, transiting in said first main supply duct and said second main supply duct, respectively.

**EP 4 000 747 A1**

Description

TECHNICAL FIELD OF THE INVENTION.

[0001] The present invention belongs to the field of dispensing liquids and/or fluids. In particular, the present invention relates to the field of dispensing atomized fluids by means of one or more nozzles or dispensing devices in general.

[0002] Even more in particular, the present invention relates to a connecting manifold element adapted to allow the easy installation of one or more compressed air atomization nozzles or devices served (supplied) by a plurality of pipes or ducts, of which in particular one intended for water supply and more than one (for example three) intended for air supply.

[0003] In detail, the present invention relates to a connecting manifold element of the aforesaid type adapted to be applied to said plurality of main ducts or pipes so as to intercept the fluids (in particular water and air) transiting in said main pipes and to dispense a mixture of said at least two fluids. Even more in detail, the present invention relates to an element of the aforesaid type conceived so that the application thereof to said main pipes or ducts is particularly simplified and fast, as well as so that it can be assembled in simple and fast manners and therefore at low costs.

BACKGROUND ART

[0004] In the field of dispensing atomized liquids, the use of one or more dispensing nozzles of the compressed air atomization type is known.

[0005] Said devices, commonly called *compressed air atomizers*, proved to be useful and are therefore widely used in the production of atomized jets consisting of fine drops of liquid obtained by a process in which a jet of air strikes drops of water, fractionating them into much smaller drops and projecting them at high speed outside the orifice of the nozzle or dispensing device.

[0006] In various industrial applications, in particular in which a series of atomizers are mounted in parallel along a plurality of supply ducts, it is often necessary to interrupt the flow of the liquid to be atomized at will, and to have a further compressed air line to modify the shape of the output atomized jet.

[0007] This is achieved through special atomizers provided with two auxiliary air inlets and with independent control, one of which activates a piston which interrupts the flow of the liquid to be atomized with a needle, while the second strikes the output atomized jet with two lateral jets of air which modify the shape thereof.

[0008] In the above cases, each atomizer must thus have four supply lines, one for liquid (usually water) and three (with independent pressure regulation) for air (or more generally gas).

[0009] This involves a series of possible drawbacks which can be summarized as follows. A first drawback is

that the installation of, for example, six atomizers involves arranging as many as twenty-four supply ducts with an apparent negative impact on assembly and/or installation times and possible sealing problems.

[0010] A second drawback is that, in the systems used in processes involving dust, there is inevitably a dramatic accumulation of encrustations on the several pipes present which, in the systems used in food or health processes, must be eliminated regularly and with great care and therefore require frequent stops with reduction of system productivity.

[0011] And finally, a further problem relates to the pressure drops in the fluid supply lines for the various atomizers, depending on the position thereof along said supply lines, wherein the atomizers farthest from the air supply source risk being supplied with insufficient air pressure, especially if the air supply line is not provided with an air inlet at each of the two ends.

[0012] To overcome the drawbacks summarized above, the following solutions have essentially been adopted.

[0013] According to a first solution, a metal support is used, such as a tube or a profile, to which atomizers and related supply lines are fastened, wherein alternatively the whole set of atomizers and related pipes is accommodated in a tube of greater diameter, and wherein in this case it is necessary to perforate said greater diameter tube at the positions provided for the spraying orifices. With considerable and intuitive costs and complications, this latter solution only overcome the problem of the rapid cleaning of the set.

[0014] According to a second solution, use is made of a modular construction with two types of elements side by side: actual atomizers and connecting pieces with the same outer profile, which are tightened together to form the final manifold; this second solution involves exorbitant costs due to the number of holes to be included (at least four for the supply ducts plus at least two for the tightening tie rods), and does not overcome the problem of pressure drops in the air ducts, on the contrary it somehow aggravates it.

[0015] It is thus the main purpose of the present invention to overcome or at least minimize the drawbacks outlined above and affecting the prior art.

[0016] In particular, it is a first object of the present invention to provide a solution which allows connecting one or more atomizers and the main pipes in a simple, safe, easy, and immediate manner. Furthermore, it is one of the objects of the present invention to provide a solution of the aforesaid type which possibly also allows the simultaneous connection of several atomizers to the main pipes.

[0017] Finally, it is a further object of the present invention to provide a solution of the aforesaid type adapted to be used in different types of systems which can be installed in different environments, i.e., both large and medium or small size, by means of simple and/or immediate operations and which, in particular, avoids drastic

structural interventions on the aforesaid structures.

DESCRIPTION OF THE PRESENT INVENTION

[0018] The present invention is based on a very simple concept, i.e., to use the support of a manifold, in particular consisting of a set of several tubes (for example four tubes) mutually constrained (for example welded together), to channel through sections of considerable dimensions both the liquid to be sprayed and the three air supplies required.

[0019] As explained below, the above general concept includes a very simple mode and does not require threaded connections of any kind to mount the atomizers on the manifold quickly while ensuring the seal of the connections.

[0020] In light of the above considerations, as well as in view of the problems and/or drawbacks encountered in the fire-fighting devices and/or systems according to the prior art, the present invention relates to a connecting manifold element according to claim 1, wherein further embodiments of the connecting manifold element according to the present invention are defined by the claims.

[0021] According to a first embodiment described, a connecting manifold element comprises a first tubular element and a second tubular element extending each between a first end thereof and a second end thereof, wherein at least the respective first ends of said first tubular element and second tubular element are adapted to be connected to a first main supply duct and a second main supply duct, respectively, so as to intercept a first fluid and a second fluid, respectively, transiting in said first main supply duct and said second main supply duct, respectively; wherein said connecting manifold element comprises a dispensing device adapted to dispense a fluid resulting from the mixing of said first fluid and second fluid, and wherein said dispensing device is rigidly fastened to said first tubular element and second tubular element and is placed in fluid communication with the interior of said first tubular element and second tubular element, respectively, so that said first fluid and second fluid intercepted by said first tubular element and second tubular element, respectively, are introduced into said dispensing device and dispensed in the form of mixture from said dispensing device.

[0022] According to an embodiment described, said dispensing device comprises a dispensing terminal and an interface element, mutually fastened and placed in mutual fluid communication, wherein said interface element is fastened to said first tubular element and second tubular element and placed in fluid communication with the interior of said first tubular element and second tubular element, respectively.

[0023] According to an embodiment described, said interface element is shaped to define a first inner channel and a second inner channel placed in fluid communication with the interior of said first tubular element and second tubular element, respectively. According to an em-

bodiment described, at least said first inner channel is placed in fluid communication with said first tubular element by means of a tubular connection element which protrudes from said interface element and is at least partially accommodated in a corresponding through seat said first tubular element. According to an embodiment described, said connecting manifold element comprises an annular sealing element interposed between said interface element and said first tubular element, wherein said tubular connection element extends through said annular sealing element.

[0024] According to an embodiment described, said first channel communicates with the exterior of said interface element to define a first inspection opening, wherein said inspection opening is closed by a first removable plug.

[0025] According to an embodiment described, said dispensing device is fastened to said first tubular element and second tubular element by fastening means comprising a plate and at least one tie rod element.

[0026] According to an embodiment described, said first tubular element and second tubular element are arranged adjacent and substantially parallel to each other, wherein said plate and said dispensing device are arranged in transversely opposite positions with respect to said first tubular element and second tubular element, and wherein said tie rod element extends between said first tubular element and second tubular element.

[0027] According to an embodiment described, the opposite ends of each of said first tubular element and second tubular element are closed by a first and second fixed closing elements and by a third and fourth fixed closing elements, respectively, wherein said first fixed closing element and third fixed closing element define a second opening and a third opening, respectively, adapted to be placed in fluid communication with said first main duct and second main duct, respectively, and wherein said second opening and third opening, respectively, are closed by a second removable plug and a third removable plug, respectively, wherein said connecting manifold element is thus adapted to intercept said first fluid and second fluid at the ends of said first main duct and second main duct, respectively.

[0028] According to an embodiment described, said second fixed closing element and fourth fixed closing element also define a fourth opening and a fifth opening, respectively, adapted to be placed in fluid communication with said first main duct and second main duct, respectively, wherein said connecting manifold element comprises a fourth removable plug and a fifth removable plug adapted to close said fourth opening and fifth opening, respectively, wherein said connecting manifold element is thus adapted to intercept said first fluid and second fluid at intermediate positions of said first main duct and second main duct, respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The present invention will be further clarified below by means of the following detailed description of the possible embodiments thereof depicted in the drawings, in which corresponding or equivalent features and/or component parts of the present invention are identified by the same reference numerals. It should be noted however that the present invention is not limited to the embodiments described below and depicted in the accompanying drawings; on the contrary, all those variants and/or changes of the embodiments described below and depicted in the accompanying drawings which will appear obvious to those skilled in the art fall within the scope of the present invention.

[0030] In the drawings:

Figure 1 shows a perspective view of a connecting manifold element according to an embodiment;

Figure 2 shows a front view of a connecting manifold element according to an embodiment;

Figure 3 shows a perspective view of a dispensing device of a connecting manifold element according to an embodiment.

Figure 4 shows a cross-sectional view of a dispensing device of a connecting manifold element according to an embodiment.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0031] The present invention finds particular application in the field of atomized water or liquid dispensing systems comprising a plurality of main supply pipes or ducts for supplying air (or gas in general) to a plurality of dispensing devices, this being the reason why the present invention will be described below with possible particular reference to the applications thereof in the field of systems of the aforesaid type. However, it is worth specifying that the possible applications of the present invention are not limited to those described below. On the contrary, the present invention finds convenient application in all cases where it is necessary to connect at least one fluid dispensing device to a plurality of main supply pipes or ducts in a quick and reliable manner.

[0032] According to the embodiment of the present invention depicted in figures 1 to 4, the self-supporting connecting manifold 100 comprises a first tubular element 101, a second tubular element 102 and a fluid dispensing device 103; in this regard, it should further be noted that as depicted, the manifold 100 can comprise a number of tubular elements greater than two (for example four tubular elements as depicted) and a number of dispensing devices 103 greater than one (for example two as depicted). However, since the tubular elements and the fluid dispensing devices of the self-supporting manifolds 100 according to the embodiments of the present invention are substantially based on the same constructive con-

cept, for reasons of clarity and synthesis, a description will be given below of a self-supporting manifold 100 comprising two tubular elements 101 and 102 and a dispensing device 103. The tubular elements 101 and 102 can in particular be made by cutting an original pipe, for example an original pipe corresponding to the two main pipes (see the description below) to which the manifold 100 is intended to be connected, in particular assuming that said two main pipes or ducts have a similar shape. It will therefore be assumed in the following, for reasons of clarity, that the self-supporting manifold 100 is intended to be connected to two adjacent and parallel main pipes having a similar shape (in particular section) to that of the two tubular elements 101 and 102. It is therefore clear that, for example, in order to connect the manifold 100 to the aforesaid two main pipes, a portion of a length corresponding to or slightly greater than that of the tubular elements 101 and 102 can be removed (for example by cutting), wherein the removed portions of the main pipes will be replaced by the tubular elements 101 and 102, wherein the connection between each of the tubular elements 101 and 102 in the manner described above will ensure that the fluids (for example air and water, respectively) transiting in said two original pipes are intercepted by the tubular element 101 and respectively by the tubular element 102. It will further appear clear from the following description that, since both the tubular elements 101 and 102 are placed in fluid communication with the dispensing device 103, the connection of the tubular elements 101 and 102 with the main pipes or ducts, and therefore the interception of the fluids transiting in said main ducts or pipes, results in the introduction of said fluids into said device 103 and in the dispensing of a fluid by the device 103 under variable forms in terms of composition, pressure, flow rate, shape of the jet or spray depending on the type of dispensing device 103 and the fluids intercepted.

[0033] In fact, as depicted, the device 103 comprises a dispensing terminal 104 (for example an atomizer) and an interface element 105, mutually fastened by means of screws 106 extending through the interface 105 and engage respective internally threaded blind holes (not shown) of the dispensing terminal 104. Furthermore, the interface 105 and the dispensing terminal 104 are placed in fluid communication by a channel 108 inside the interface 105, extending perpendicularly to the main opposite and parallel surfaces 1050 and 1051 of the interface 105 which delimit the interface 105 in the direction of the thickness thereof, wherein one end of the channel 108 opens onto the surface 1051 of the interface 105 placed in contact with the dispensing terminal 104. Furthermore, the channel 108 is positioned at and thus placed in communication with a cavity 109 of the dispensing terminal 104, which in turn communicates with the dispensing end 110 (for example a nozzle) of the dispensing terminal 104, for example by means of a mixing and/or atomization chamber (not shown).

[0034] The interface 105 comprises a second channel

107 parallel to said first channel 108, wherein the second channel 107 comprises an end which opens onto the surface 1050 of the interface 105 opposite the surface 1051. Said first channel 108 and second channel 107 are also intercepted by a third channel 111 extending perpendicularly to said first channel 108 and second channel 107 (and therefore along a direction substantially parallel to the surfaces 1050 and 1051), wherein said third channel 111 opens onto a transverse surface of the interface 105 to define an opening 112 closed by a removable screw plug 113.

[0035] Again as shown, a tubular connection element 114 is fastened to the interface 105 at the second channel 107 and partially protrudes from the surface 1050 of the interface 105, a sealing ring 115 being positioned on the surface 1050 of the interface 105 to surround the protruding part of the tubular connection element 114. With the dispensing device 103 fastened to the tubular elements 101 and 102 as shown in figures 2 and 3 (as well as according to the methods explained below), the tubular connection element 114 is placed at and put in communication with a hole (not shown in the figures) obtained through the wall of the tubular element 101 placed in contact with the interface 105, the dispensing terminal 104 therefore being placed in fluid communication with the interior of the tubular element 101.

[0036] What is described above is also applicable to the tubular element 102 the interior of which is placed in fluid communication with the dispensing device 103 through a hole obtained in the wall thereof in contact with the interface 105 and in turn placed in fluid communication with the dispensing terminal 104 by an annular connection element, a first, a second and a third channel as well as a cavity similar to the connection 104, the first channel 108, the second channel 107, the third channel 111 and the cavity 109, respectively.

[0037] Furthermore, the methods described above according to which the tubular elements 101 and 102 are placed in fluid communication with the dispensing device 104 can also be applied to put further tubular elements in fluid communication with the dispensing device 104, as in case of the tubular elements 121 and 122 and as deducible from the observation of figure 3 in which two further annular connection elements 1140 and 1141 are depicted (surrounded by respective sealing rings 1150) for the communication of the interface 105 (and therefore of the entire dispensing device 103) with the tubular element 121 and respectively with the tubular element 122.

[0038] According to the embodiment depicted in the figures (see in particular figure 1), the tubular elements 101 and 102 and the dispensing device 103 are mutually constrained from a mechanical and/or structural point of view, by a constraint plate 150 which is placed abutting against the surfaces of the tubular elements 101 and 102 opposite the dispensing device 103, wherein the constraint plate 150 extends substantially transversely to the longitudinal extension direction of the tubular elements 101 and 102. Two bolts or screws 151 each extend

through a respective through hole of the plate 150 and each engage a respective internally threaded blind hole 152 defined by the interface element 105, wherein the bolts 151 extend into the space between the two adjacent terminals 101 and 102.

[0039] Finally, it should be noted that the opposite ends of each of the tubular elements 101 and 102 are closed by a metal plate, for example welded, in which an opening 160 is made which is adapted to be closed by a removable plug (not shown), wherein in the absence of the plug, the opening 160 can be placed in fluid communication with a main duct or pipe in order to intercept the fluid in transit in said main duct or pipe.

[0040] Therefore, it has been demonstrated, by means of the previous detailed description of the embodiments of the present invention depicted in the drawings, that the present invention allows achieving the desired results and overcoming or at least limiting the drawbacks affecting the prior art.

[0041] In particular, the present invention provides a connecting manifold element which:

- allows connecting one or more atomizers or in general devices for dispensing fluids with a plurality of main pipes in simple, safe, easy and immediate manners;
- it possibly also allows the simultaneous connection of several atomizers to the main pipes;
- is adapted to be used in systems of different types which can be installed in different environments, i.e., both large and medium or small size, by means of simple and/or immediate operations and which, in particular, avoid drastic structural interventions on the aforesaid structures.

[0042] Although the present invention is explained above by means of the detailed description of the embodiments thereof depicted in the drawings, the present invention is not limited to the embodiments described and depicted in the drawings; on the contrary, all those variants and/or changes of the embodiments described and depicted in the accompanying drawings which will appear obvious and immediate to those skilled in the art fall within the scope of the present invention and. For example, the self-supporting manifold element according to the present invention allows the widest choice of components, e.g., dispensing devices, as well as materials for manufacturing it. Furthermore, the choice of the number of components, in particular of the tubular elements and dispensing devices, can also be tuned to the specific purposes and/or needs and/or circumstances.

[0043] Finally, the fact that the opposite ends of the tubular elements each comprise a reclosable opening allows the manifold element according to the present invention to be installed both in an intermediate position along a plurality of main pipes (and therefore with each of the tubular elements with the opening ends 160 open to form a connecting element between two successive

portions of a main pipe) and in a terminal or end position (and therefore with each of the tubular elements with an opening 160 open and the opposite one closed to form a terminal element of a main pipe.

[0044] And again, the present invention allows the use of tubular elements with a desired cross section, and therefore not only rectangular as shown, but also for example square or octagonal.

[0045] The scope of protection of the present invention is thus defined by the claims.

Claims

1. A connecting manifold element (100) comprising a first tubular element (101) and a second tubular element (102) extending each between a first own end thereof and a second own end thereof, wherein at least the respective first ends of said first tubular element (101) and second tubular element (102) are adapted to be connected to a first main supply duct and a second main supply duct, respectively, so as to intercept a first fluid and a second fluid, respectively, transiting in said first main supply duct and said second main supply duct, respectively; **characterized in that** said connecting manifold element (100) comprises a dispensing device (103) adapted to dispense a fluid resulting from the mixing of said first fluid and second fluid, **and in that** said dispensing device (103) is rigidly fastened to said first tubular element (101) and second tubular element (102) and is placed in fluid communication with the interior of said first tubular element (101) and second tubular element (102), respectively, so that said first fluid and second fluid intercepted by said first tubular element (101) and second tubular element (102), respectively, are introduced into said dispensing device (103) and dispensed in the form of mixture from said dispensing device (103).
2. A connecting manifold element (100) according to claim 1, **characterized in that** said dispensing device (103) comprises a dispensing terminal (104) and an interface element (105), mutually fastened and placed in mutual fluid communication, **and in that** said interface element (105) is fastened to said first tubular element (101) and second tubular element (102) and placed in fluid communication with the interior of said first tubular element (101) and second tubular element (102), respectively.
3. A connecting manifold element (100) according to claim 2, **characterized in that** said interface element (105) is shaped to define a first inner channel (108, 107, 111) and a second inner channel (108, 107, 111) placed in fluid communication with the interior of said first tubular element (101) and second tubular element (102), respectively.
4. A connecting manifold element (100) according to claim 3, **characterized in that** at least said first inner channel (108, 107, 111) is placed in fluid communication with said first tubular element (101) by means of a tubular connection element (114) which protrudes from said interface element (105) and is at least partially accommodated in a corresponding through seat said first tubular element (101).
5. A connecting manifold element (100) according to claim 4, **characterized in that** it comprises an annular sealing element (115) interposed between said interface element (105) and said first tubular element (101), and **in that** said tubular connection element (114) extends through said annular sealing element (115).
6. A connecting manifold element (100) according to one of claims 1 to 5, **characterized in that** said first channel (108, 107, 111) communicates with the exterior of said interface element (105) to define a first inspection opening (112), **and in that** said inspection opening (112) is closed by a first removable plug (113).
7. A connecting manifold element (100) according to one of claims 1 to 6, **characterized in that** said dispensing device (103) is fastened to said first tubular element (101) and second tubular element (102) by fastening means comprising a plate (150) and at least one tie rod element (151).
8. A connecting manifold element (100) according to claim 7, **characterized in that** said first tubular element (101) and second tubular element (102) are arranged adjacent and substantially parallel to each other, **in that** said plate (150) and said dispensing device (103) are arranged in transversely opposite positions with respect to said first tubular element (101) and second tubular element (102), **and in that** said tie rod element (151) extends between said first tubular element (101) and second tubular element (102).
9. A connecting manifold element (100) according to one of claims 1 to 8, **characterized in that** the opposite ends of each of said first tubular element (101) and second tubular element (102) are closed by a first and second fixed closing elements and by a third and fourth fixed closing elements, respectively, **in that** said first fixed closing element and third fixed closing element define a second opening (160) and a third opening (160), respectively, adapted to be placed in fluid communication with said first main duct and second main duct, respectively, **and in that** said second opening (160) and third opening (160), respectively, are closed by a second removable plug and a third removable plug, respectively, wherein,

said connecting manifold element (100) is thus adapted to intercept said first fluid and second fluid at the ends of said first main duct and second main duct, respectively.

5

10. A connecting manifold element (100) according to claim 9, **characterized in that** said second fixed closing element and fourth fixed closing element also define a fourth opening (160) and a fifth opening (160), respectively, adapted to be placed in fluid communication with said first main duct and second main duct, respectively, **and in that** said connecting manifold element (100) comprises a fourth removable plug and a fifth removable plug adapted to close said fourth opening (160) and fifth opening (160), respectively, wherein said connecting manifold element (100) is thus adapted to intercept said first fluid and second fluid at intermediate positions of said first main duct and second main duct, respectively.

10

15

20

25

30

35

40

45

50

55

Fig.1

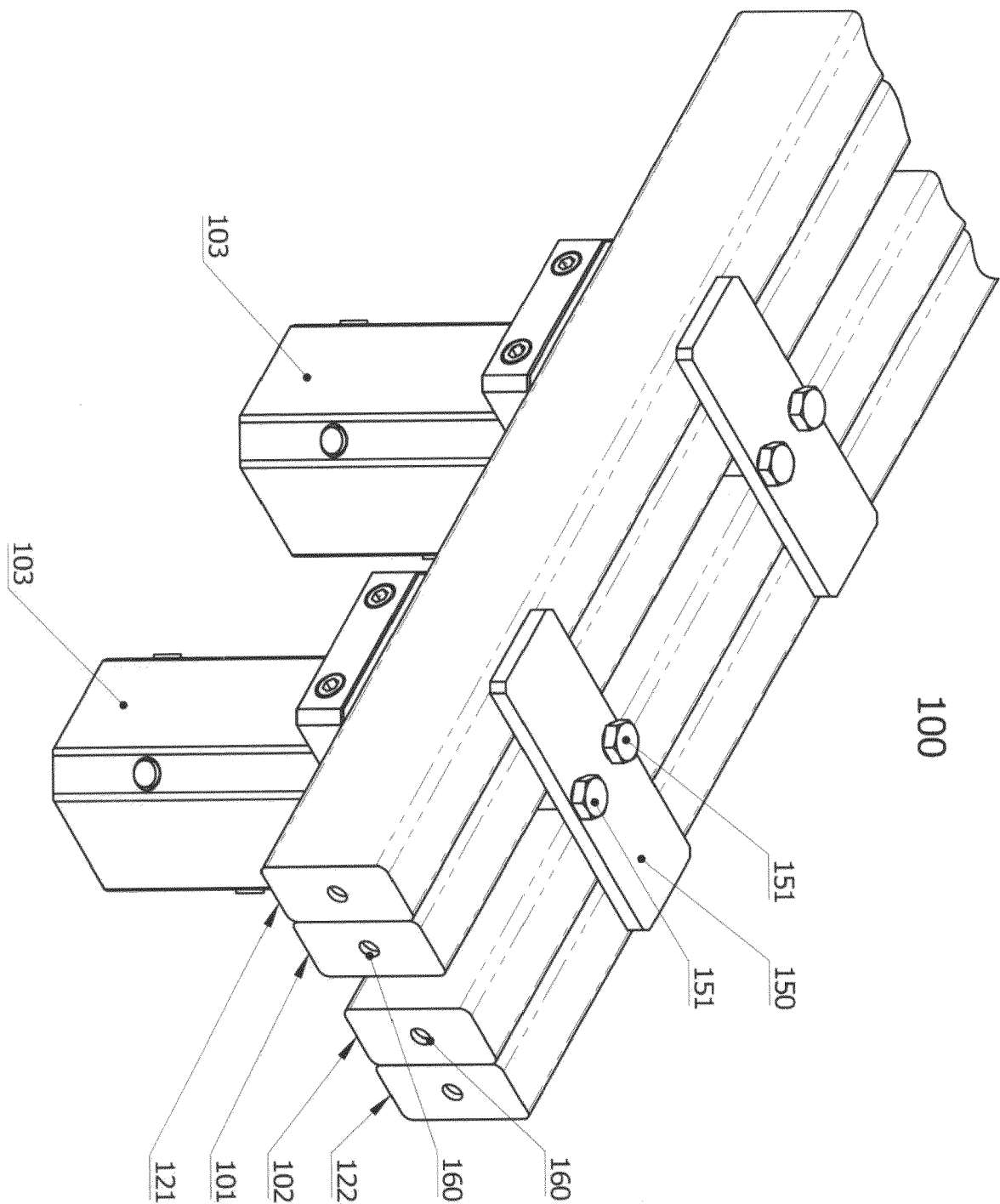


Fig.2

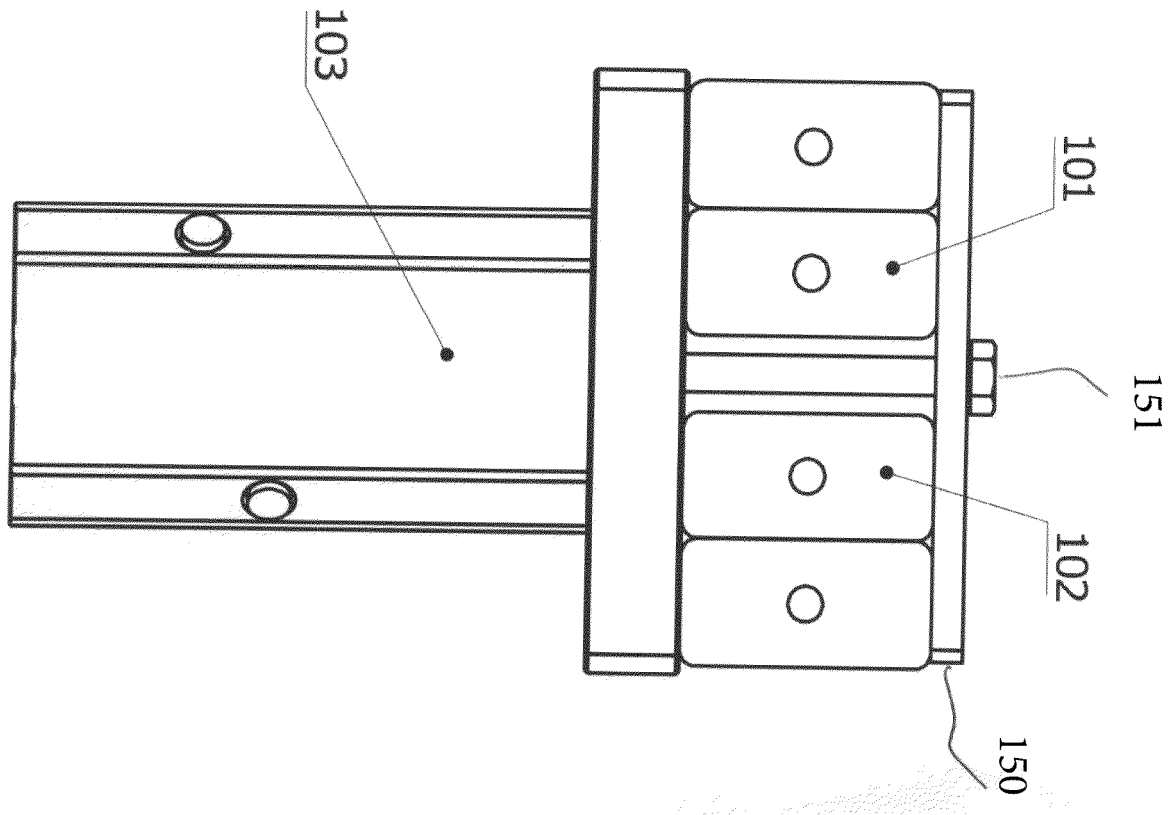


Fig.3

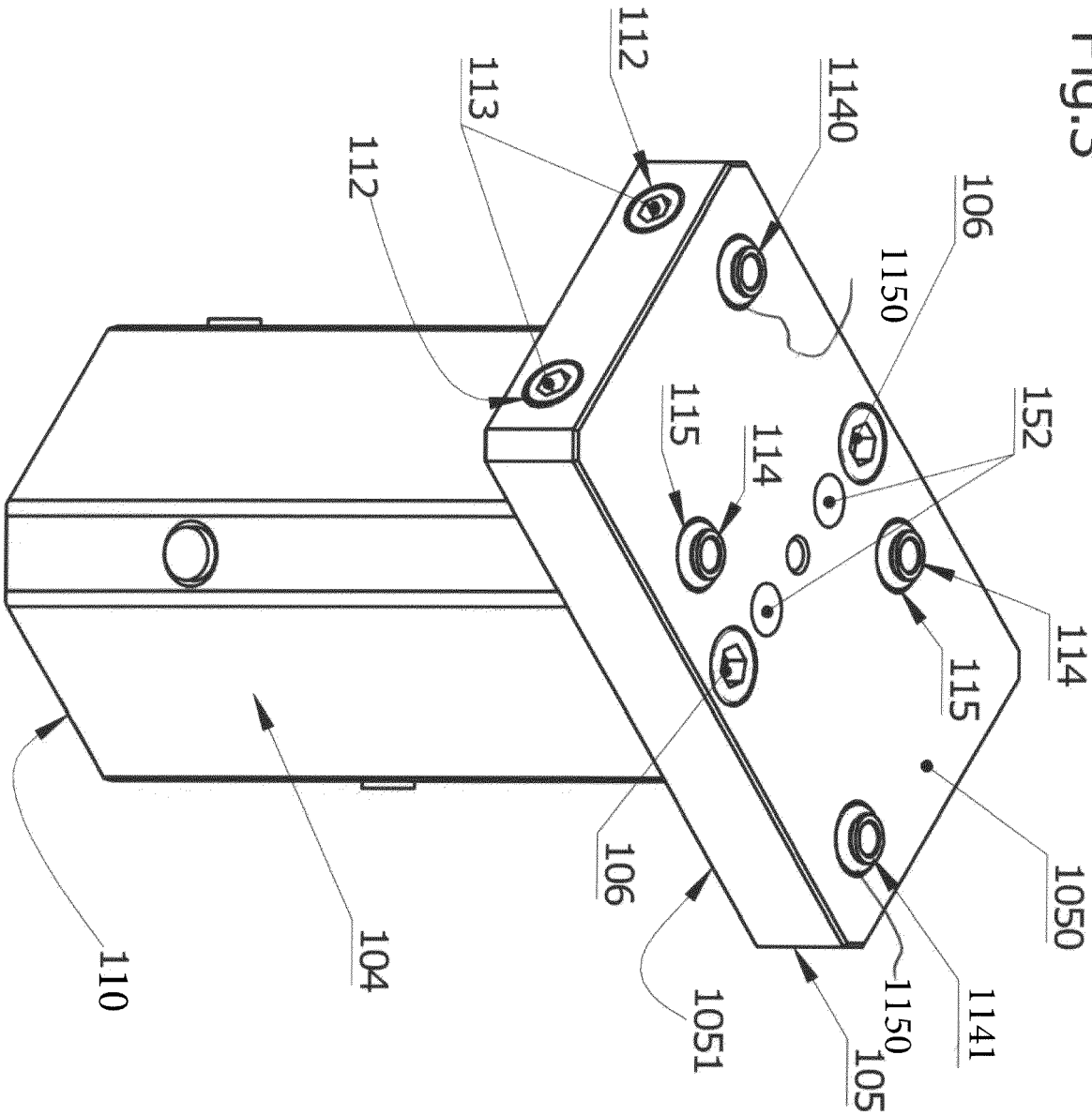
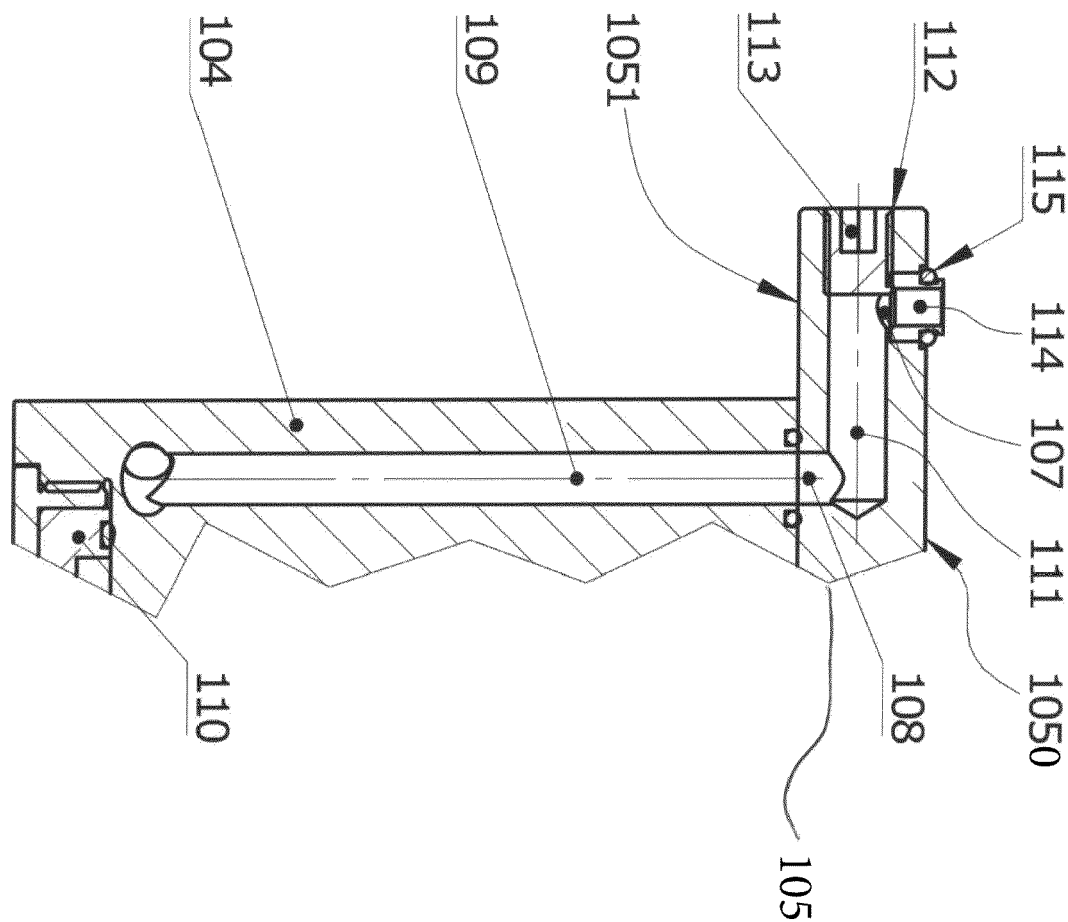


Fig.4





EUROPEAN SEARCH REPORT

Application Number

EP 21 20 9201

5

10

15

20

25

30

35

40

45

50

55

2

EPO FORM 1503 03.82 (P04C01)

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	US 2019/151871 A1 (JERDEE JEFFREY S [US] ET AL) 23 May 2019 (2019-05-23) * abstract; figures 1-6F * * paragraph [0018] - paragraph [0020] * -----	1-5	INV. B05B15/658 B05B7/04
X	US 2007/029411 A1 (HUFFMAN DAVID C [US] ET AL) 8 February 2007 (2007-02-08) * abstract; figures 1-18 * * paragraph [0027] - paragraph [0030]; figure 18 * -----	1,6-8 9,10	
X	WO 95/24970 A1 (MISTER DRIPPER COMPANY LLC [US]) 21 September 1995 (1995-09-21) * abstract; figures 3-5 * * page 11, line 30 - page 13, line 33 * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B05B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 March 2022	Examiner Frego, Maria Chiara
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 20 9201

5

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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-03-2022

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 2019151871	A1	23-05-2019	CN	111344069 A		26-06-2020
			EP	3713677 A1		30-09-2020
			US	2019151871 A1		23-05-2019
			WO	2019103796 A1		31-05-2019

US 2007029411	A1	08-02-2007	BR	PI0714864 A2		21-05-2013
			CA	2659312 A1		07-02-2008
			CN	101522310 A		02-09-2009
			EP	2049267 A2		22-04-2009
			US	2007029411 A1		08-02-2007
			WO	2008016557 A2		07-02-2008

WO 9524970	A1	21-09-1995	AU	1966395 A		03-10-1995
			US	5465905 A		14-11-1995
			US	5794849 A		18-08-1998
			WO	9524970 A1		21-09-1995
