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(54) A system for spreading a liquid in the form of a mist

(57) The invention relates to a system for use in a greenhouse, a stable, an outdoor café or the like for spreading a liquid substantially in atomized form, comprising one or more pipes (6) for supplying the liquid and manifolds (3) connected to said pipe(s), on which spray nozzles (10) are mounted, via which spray nozzles the liquid is delivered substantially in atomized form. Pipe sections (6) being at least substantially in line are connected to the manifolds (3) at two opposite connecting points (7) on the circumference of the manifold (3), and a number of spray nozzles (10) are connected to the manifold at further connecting points provided on the circumference of the manifold (3), wherein the connecting points are distributed over the circumference of the manifold and wherein the central axes of the pipe sections connected to the manifold and the central axes of the spray nozzles connected to the manifold lie at least substantially in one plane.

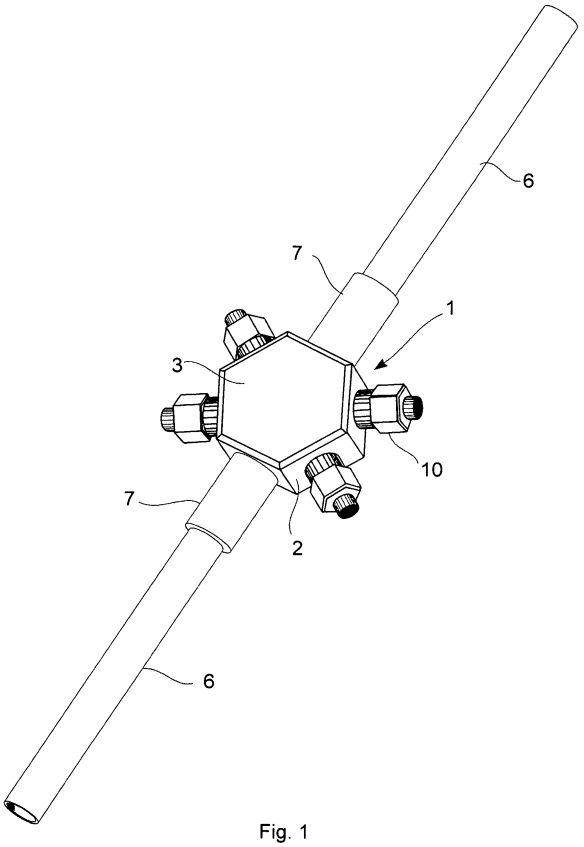

Fig. 1

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Description

[0001] The invention relates to a system for use in a greenhouse, a stable, an outdoor café or the like for spreading a liquid substantially in atomized form, comprising one or more pipes for supplying the liquid and manifolds connected to said pipes, on which spray nozzles are mounted, via which spray nozzles the liquid is delivered substantially in atomized form.

[0002] The atomization of liquid, generally water, in greenhouses takes place in particular in the summer for the purpose of controlling the temperature and keeping up the humidity level in the greenhouse. Furthermore, atomization makes it possible to influence the leaf temperature of the plants in the greenhouse, whilst in addition the atomized liquid can bring about a rapid cooling effect in the greenhouse, if necessary. The liquid in atomized form is usually spread in horizontal direction as a fine mist in that case.

[0003] From publication US 2004/121660 A1 there is known a system in which the spray nozzles are directly mounted on the pipe. This involves a difficult fitting operation of the spray nozzles, however, whilst the connection between the spray nozzles and the tube is vulnerable.

[0004] From said US publication there is furthermore known a system in which the spray nozzles are connected to pipe sections by means of manifolds in such a manner that the central axes of the spray nozzles are arranged in a plane perpendicular to the central axes of the tube sections. Because of this configuration of the system, it is generally not possible to realise a compact construction of the system for use in spreading the liquid in atomized form in a desired plane.

[0005] The object of the invention is to provide a system of the above kind in which the drawbacks of the known system can be avoided.

[0006] According to the invention, this object can be accomplished in that pipe sections being at least substantially in line are connected to the manifolds at two opposite connecting points on the circumference of the manifold, and in that at least three spray nozzles are connected to the manifold at further connecting points provided on the circumference of the manifold, wherein the connecting points are distributed over the circumference of the manifold and wherein the central axes of the pipe sections connected to the manifold and the central axes of the spray nozzles connected to the manifold lie at least substantially in one plane.

[0007] Using the construction according to the invention, it is readily possible to fit manifolds in spaced-apart relationship in a pipe, wherein the arrangement of the central axes of the pipe sections and the central axes of the spray nozzles connected to the manifolds in one plane makes it possible to spread a liquid in atomized form over a large area, so that a continuous area of atomized liquid parallel to the ground surface, and thus an adequate covering of the area in question in the greenhouse or the like, can be effected by the mist formed by the overall construction when the pipe is horizontally mounted in a greenhouse or the like. The spreading of the liquid in atomized form can be partially influenced inter alia by the selection of the length of the pipe sections between the manifolds and/or by adapting the spray nozzles on each of the manifolds to each other.

[0008] Preferably, the manifold has a regular hexagonal cross-section. Such a manifold can be manufactured in a simple and inexpensive manner, for example by cutting through an elongated bar of hexagonal cross-section.

[0009] The invention will be explained in more detail hereinafter with reference to a few possible embodiments shown in the accompanying figures.

Figure 1 is a perspective view of a manifold with nozzles mounted thereon and pipe sections connected thereto.

Figure 2 is a top plan view of a manifold with nozzles mounted thereon and pipes connected thereto.

Figure 3 is a cross-sectional view of the manifold shown in figures 1 and 2.

Figure 4 is an exploded, perspective view of the manifold and the parts connected thereto.

Figure 5 shows a variant of the embodiment shown in figures 1-4.

Figure 6 shows an embodiment comprising three nozzles on a manifold.

Figure 7 shows an embodiment with two pipe sections.

[0010] Like parts are indicated by the same numerals in the various figures.

[0011] The embodiment of a manifold 1 shown in figures 1-4 has a regular hexagonal cross-section and comprises six lateral surfaces 2 and upper and lower boundary surfaces 3 extending perpendicularly to said lateral surfaces.

[0012] As figure 3 clearly shows, bores 4 extending perpendicularly to the lateral surfaces 2 and intersecting each other in the centre of the manifold are provided in the manifold body. The bore ends connecting to two diametrically opposed lateral surfaces 2 are provided with screw thread 5. Said bores provided with screw thread 5 function as connecting points for connecting pieces 7 provided on the ends of pipe sections 6.

[0013] As figure 4 shows, said connecting pieces 7 are provided with grooves 8 at their ends extending into the manifold 1 for receiving sealing rings 9.

[0014] Spray nozzles 10 being in communication with the bores 4 are provided on the four lateral surfaces 2 to which no pipe sections are connected.

[0015] The spray nozzles 10 are built up in a known manner of a housing 11 to be inserted into one end of a bore 4. A filter 12 is fitted in one end of the housing 11, whilst a spray head 13 is mounted to the other end of the housing.

[0016] The pipe sections 6, which are in line with each other, will form a pipe extending through the greenhouse, which pipe is provided with evenly spaced manifolds 1 fitted with spray nozzles 10. The spreading of the atomized liquid can be influenced in part by adapting the length of the pipe sections.

[0017] In use a liquid, generally water, will be supplied to the manifolds 1 via the pipe 6, and said liquid can be squirted from the spray nozzles 10 in the form of a fine mist via a chamber formed by the intersecting bores 4 in the manifold. The spray jets exiting the spray nozzles 10 on a manifold 1 include an angle with each other and are thus capable of covering a large area, so that an effective continuous "mist curtain" can be formed parallel to the ground surface in the greenhouse.

[0018] Although it will generally be preferred to use a manifold having a hexagonal cross-section, since such a hexagonal shape will make it easier to form the bores 4 extending perpendicularly to the lateral surfaces thereof and to connect the spray nozzles 10 and the pipe sections 6 in an effectively sealed manner, it is also possible, of course, to use a different cross-sectional shape of the manifold, for example the circular shape of the manifold 1 shown in figure 5. Also in this case bores 4 will be formed in the manifold in a corresponding manner as in the manifold as described above.

[0019] Also other polygonal cross-sectional shapes or, for example, oval shapes of the manifold are possible.

[0020] Also further embodiment variants, in particular of the manifold, are possible within the spirit and scope of the invention. The simplest form of the manifold will generally be obtained if the lower and upper boundary surfaces of the manifold extend perpendicularly to the sides of the manifold. The bottom side of the manifold may also have a rounded form, for example in order to prevent objects hooking behind the bottom side of the manifold.

[0021] Although the invention has been explained in the foregoing in particular on the basis of the use of the system in a greenhouse, it will be understood that the system can also be used for humidifying/moisturizing other areas or surfaces.

[0022] Figure 6 shows an embodiment in which parts corresponding to parts of the preceding embodiments are indicated by the same numerals as in the preceding embodiments. In this embodiment, three spray nozzles 10 are mounted on a manifold 1, viz. a single spray nozzle 10, whose central axis extends perpendicularly to the central axes of the pipe sections 6, on one side of the pipe sections 6, and two spray nozzles 10, which are arranged in a similar way relative to each other and to the pipe sections 6 as the spray nozzles of the preceding embodiments, on the other side of said pipe sections. By arranging the single spray nozzles alternately on one side and on the other side of the pipe formed by the pipe sections 6, as shown in figure 6, an effective distribution of the atomized liquid in the horizontal plane, and thus an adequate covering of the respective area in the greenhouse of the like by the mist formed by the overall construction can be realised in combination with the two other spray nozzles mounted on the respective manifolds.

[0023] Figure 7 shows in an embodiment the manner in which two adjacent assemblies extending parallel to each other of pipe sections 6 and manifolds 1 provided with nozzles 10 may be oriented relative to each other so as to realise an effective coverage and distribution of the atomized liquid over an area of a greenhouse or the like. In the embodiment of figure 7, the nozzles 10 of two adjacent manifolds 1 on the same pipe section 6 are oriented in opposite directions, and the nozzles of two adjacent manifolds 1 on adjacent pipe sections are oriented identically to each other. Other orientations are also possible, of course.

Claims

1. A system for use in a greenhouse, a stable, an outdoor café or the like for spreading a liquid substantially in atomized form, comprising one or more pipes for supplying the liquid and manifolds connected to said pipe(s), on which spray nozzles are mounted, via which spray nozzles the liquid is delivered substantially in atomized form, **characterised in that** pipe sections being at least substantially in line are connected to the manifolds at two opposite connecting points on the circumference of the manifold, and **in that** at least three spray nozzles are connected to the manifold at further connecting points provided on the circumference of the manifold, wherein the connecting points are distributed over the circumference of the manifold and wherein the central axes of the pipe sections connected to the manifold and the central axes of the spray nozzles connected to the manifold lie at least substantially in one plane.

2. A system according to claim 1, **characterised in that** four nozzles are connected to the manifold, with the connecting points for the pipe sections and the spray nozzles being evenly distributed over the circumference of the manifold.

3. A system according to claim 1 or 2, **characterised in that** the manifold has a hexagonal cross-section.

4. A system according to claim 3, **characterised in that** the manifold has a regular hexagonal cross-section.

5. A system according to any one of the preceding claims, **characterised in that** three bores intersecting each other and extending through the manifold are provided in the manifold.

6. A system according to claim 1, **characterised in that** the manifold is provided with three spray noz-

zles, one spray nozzle being disposed on one side of the pipe sections, its central axis extending perpendicularly to the central axes of the pipe sections, and two other spray nozzles being disposed on the other side of the pipe sections, their central axes extending at an angle to the central axes of the pipe sections.

7. A system according to claim 6, **characterised in that** successive manifolds in a pipe formed by the pipe sections are so arranged that spray nozzles supported by the respective manifolds are alternately positioned on one side of the pipe and on the other side of the pipe.

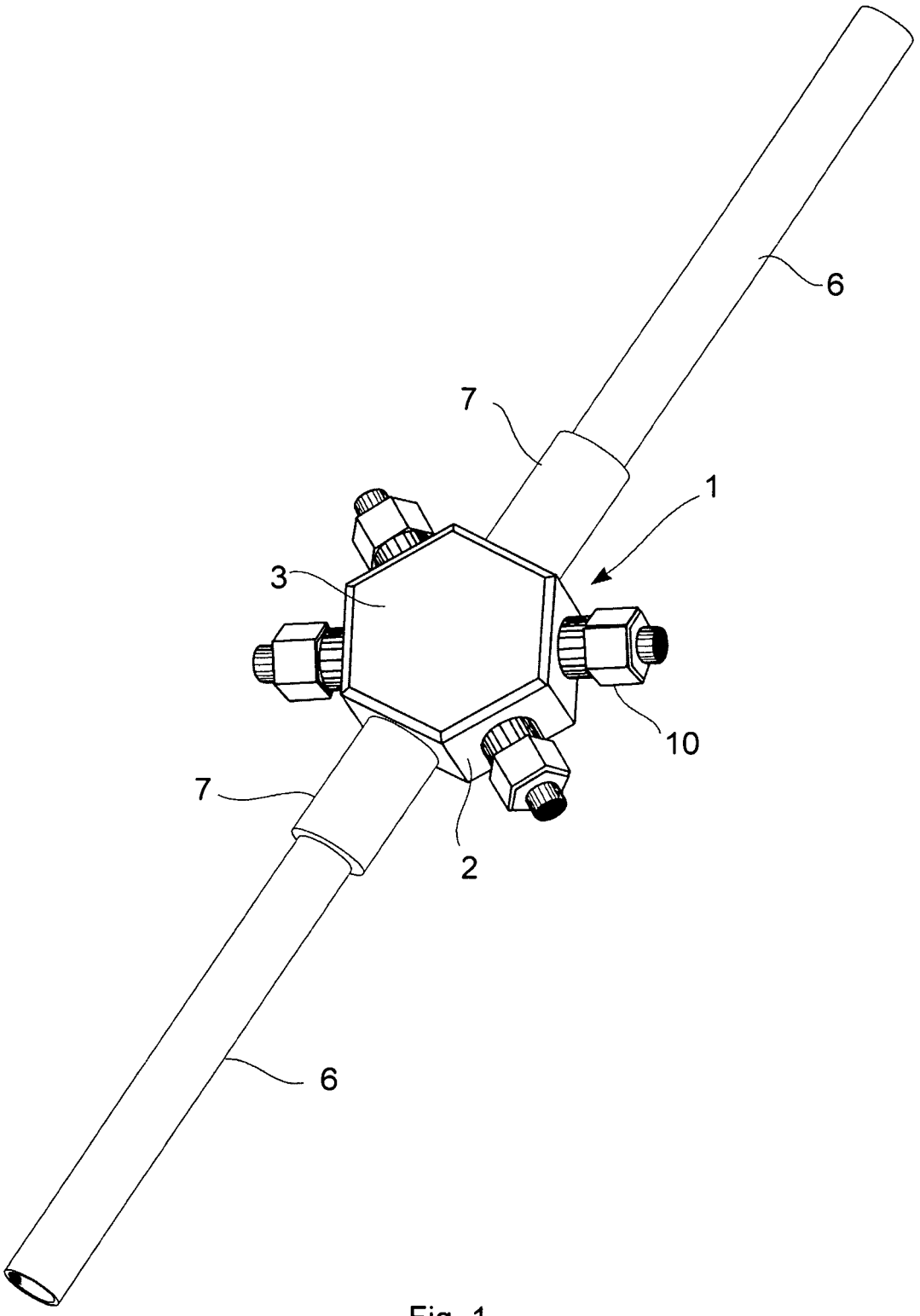

Fig. 1

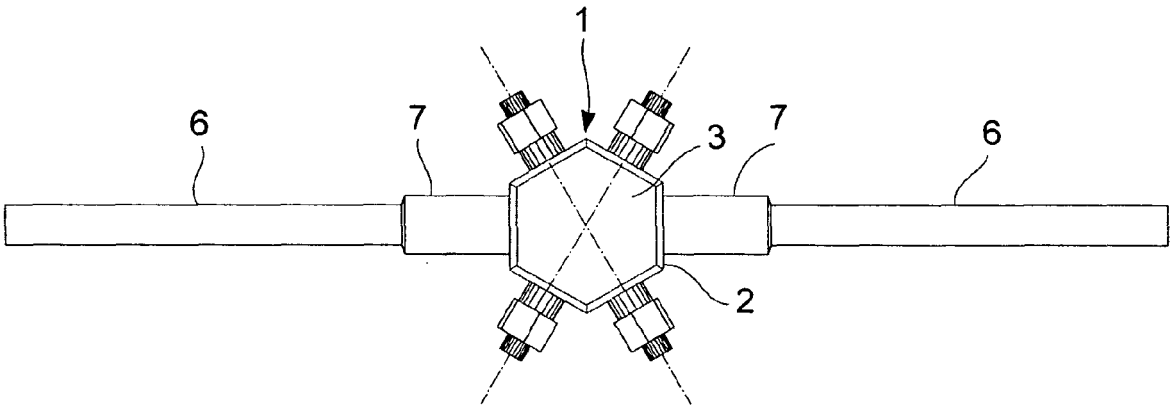

Fig.2

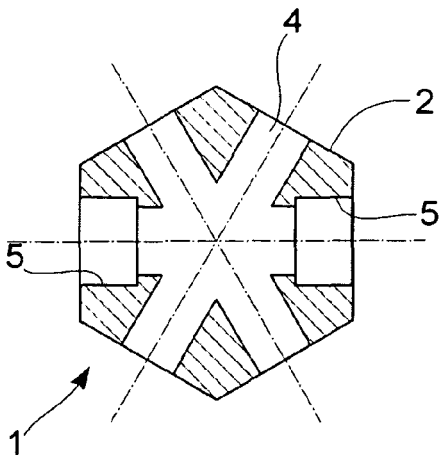

Fig.3

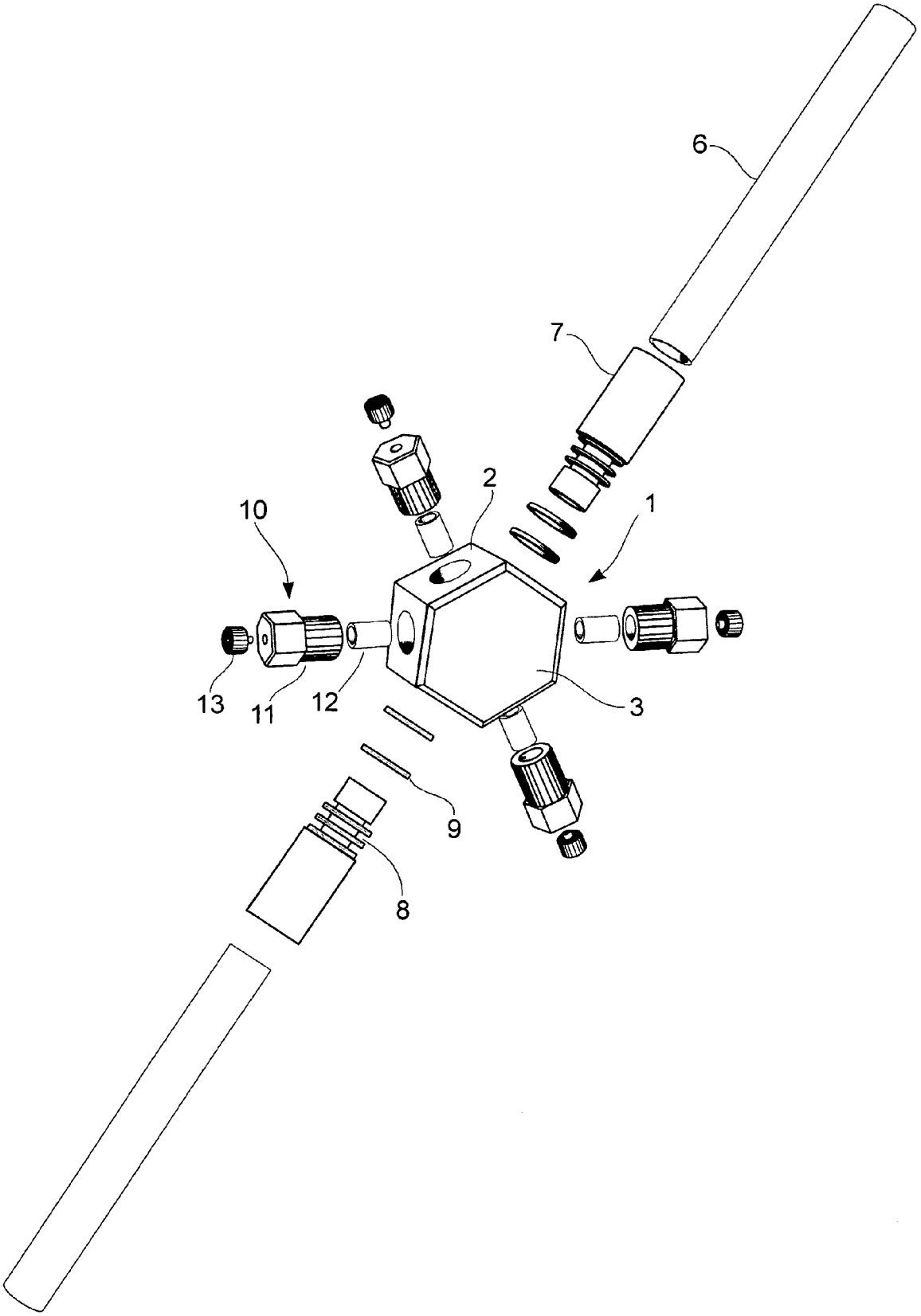

Fig. 4

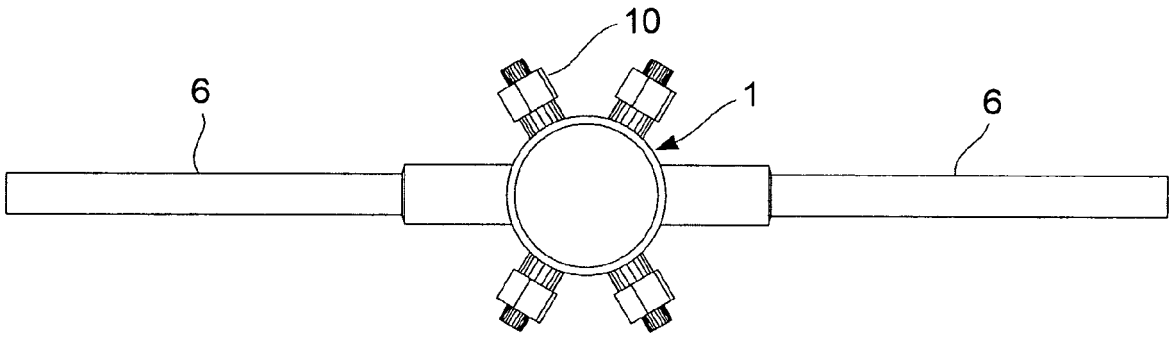

Fig.5

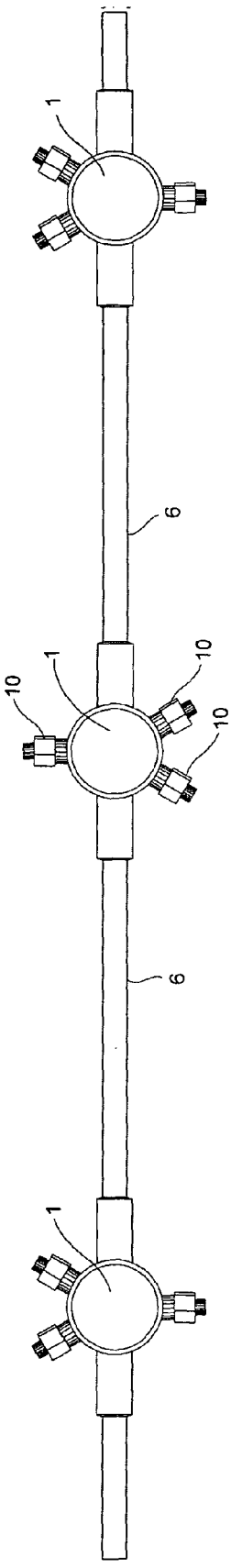

Fig.6

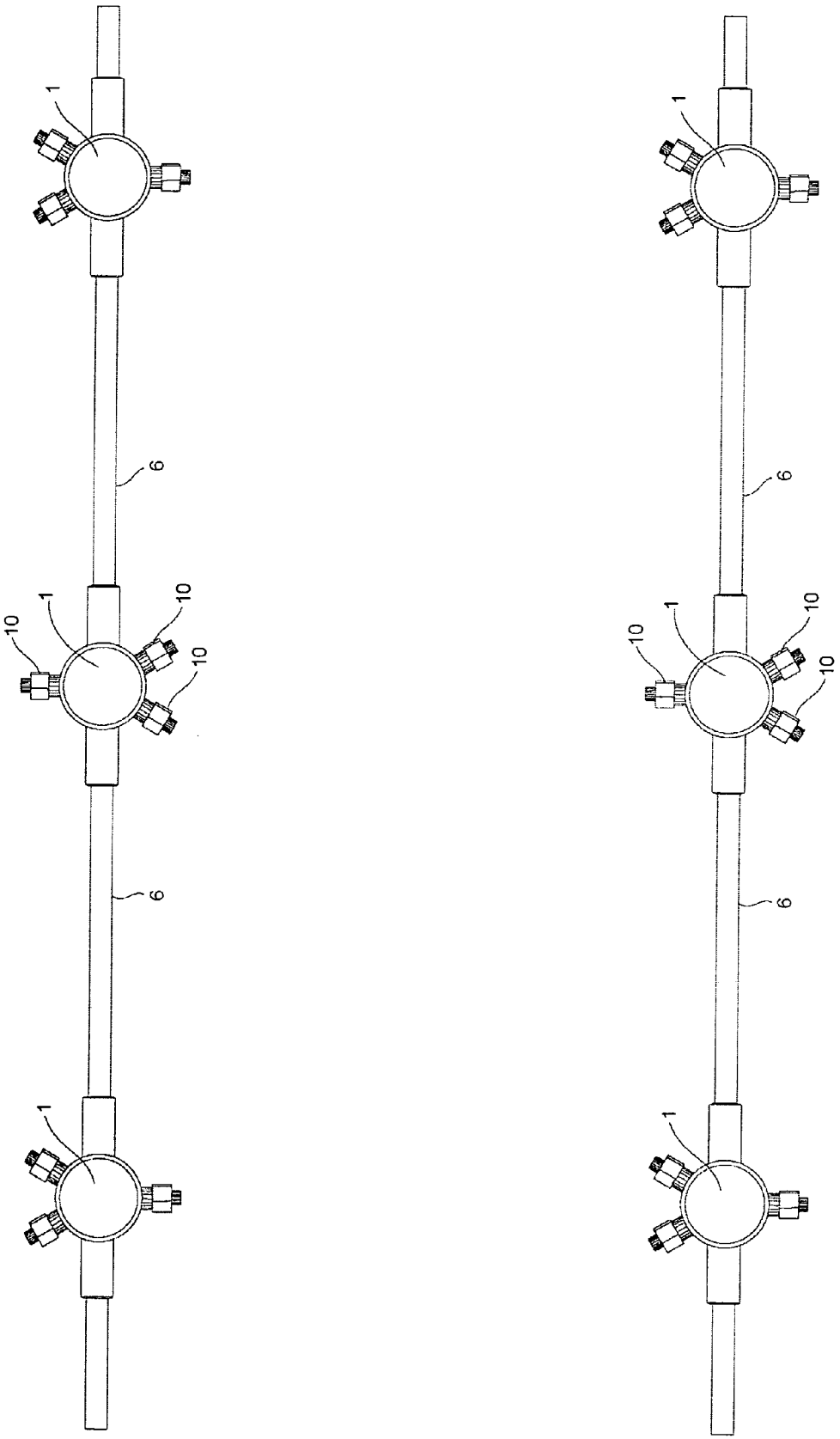

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 08 00 9000

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

B05B
A62C
A01G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 September 2008	Barré, Vincent

CATEGORY OF CITED DOCUMENTS

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08-09-2008

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

REFERENCES CITED IN THE DESCRIPTION

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