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(54) **Arrangement of a fiber web production line and method of a fiber web production line**

(57) The invention relates to an arrangement of a coating or sizing section of a fiber web production line, in which section a treatment substance, in particular a coating or sizing medium, is applied onto the fiber web by spraying, which arrangement comprises nozzles (11, 12) located in at least one nozzle row extending in cross-direction i.e. in width direction of the fiber web (W) for spraying the treatment substance onto the fiber web (W). The nozzles (11, 12) comprise continuous operating nozzles (11) located at least in the middle of the nozzle row and adjustable or closable nozzles (12) located at least at one end of the row. The invention also relates to a method of a coating or sizing section of a fiber web pro-

duction line, in which method a treatment substance, in particular a coating or sizing medium, is applied onto the fiber web (W) by spraying by nozzles (11, 12) located in at least nozzle row extending in cross-direction i.e. in width direction of the fiber web for spraying the treatment substance onto the fiber web. In the method the treatment substance is supplied by continuously operating nozzles (11) located at least in the middle of the nozzle row i.e. supplying treatment substance onto the middle parts of the fiber web (W) in cross direction and by adjustable or closable nozzles (12) located at least at one end of the nozzle row i.e. supplying treatment substance to the corresponding edge area of the fiber web (W).

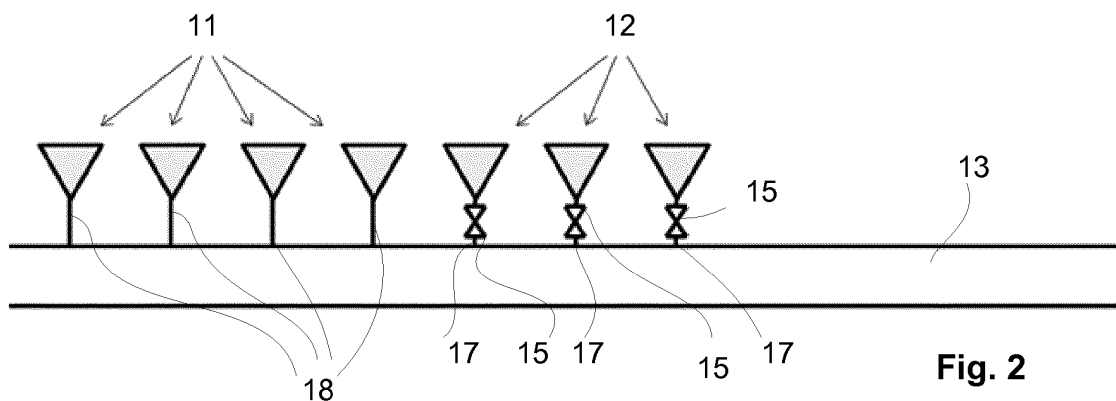


Fig. 2

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Description

[0001] The invention relates to an arrangement of a fiber web production line and to a method in a fiber web production line. Especially the invention relates to an arrangement and to a method of a coating or sizing section of a fiber web production line, in which section the coating or sizing medium is applied on the fiber web by spray means. More especially the invention relates to an arrangement according to the preamble part of claim 1 and to a method according to the preamble part of claim 10.

[0002] As known from the prior art in fiber web producing processes typically comprise an assembly formed by a number of apparatuses arranged consecutively in the process line. A typical production and treatment line comprises a head box, a wire section and a press section as well as a subsequent drying section and a reel-up. The production and treatment line can further comprise other devices and sections for finishing the fiber web, for example, a sizer, a calender, a coating section. The production and treatment line typically also comprises a reel-up and at least one winder for winding customer rolls as well as at least one roll packaging apparatus. In this description and the following claims by fiber webs are meant for example paper and board webs.

[0003] In production of fiber webs, for example of paper or board webs, sizing is used to alter the properties of a fiber web by adding sizing agents (sizing medium), for example glue chemicals. Sizing can be divided to internal sizing and surface sizing. In internal sizing the sizing agent is added to pulp in the wet end of the fiber web machine before forming. In surface sizing the sizing agent is added onto the surface of the fiber web at the dry end of the fiber web machine.

[0004] In production of fiber webs, for example of paper or board webs, in coating, especially the surface of a fiber web is formed with a layer of coating color (coating medium) at a coating station followed by drying. The formation of a coating in direct coating applications can be divided in supplying the coating color onto the web surface, which is called the application of the coating color, as well as in the adjustment of final amount of coating color. In indirect coating applications the adjustment of the color amount is controlled already when supplying the color.

[0005] The coating or the sizing of a fiber web typically utilizes a coating device - a coater - or a sizing device - a sizer, which together with for example drying devices following the coater/sizer form the coating / sizing section of a fiber web production line. In connection with the coaters and sizers different kinds of application technology for application of the coating or the sizing medium on the fiber web are employed in prior art arrangements, for example curtain technology or blade application technology or rod application technology or air brush application technology or spray application technology. The present invention relates to spray application technology.

[0006] In WO publication 2006/058961 A1 is disclosed a method and arrangement for processing a paper or

board web or similar fiber web. In this prior art method a processing mixture is applied on the surface of the web with spray nozzles. In WO publication 02/072953 is disclosed an assembly for treating a moving web of paper of board with web treatment substance which assembly comprises an application chamber located in at close vicinity of the moving web and facing the web and at least one linear nozzle array incorporating at least one nozzle for spraying the web treatment substance on the web. In FI utility model registration 9401 is disclosed a device for treating a fiber web, which comprises an application device, in particular a spraying device, for applying treatment substance on a moving fiber web.

[0007] The coating and sizing units can be located in different positions in the fiber web production line, for example at a wire section, or at a press section, or at a drying section comprising drying cylinders. However, the typical location is after the pre-dryer section, when the web moisture is typically between 2-12 %. Typical flow amount window for a nozzle in pressure range 3-12 bar is set point ± 30 %. Typical sizing amount as dry for wood-free copy and special papers is 0.5-1.5 g/m² and for different board grades 1-3 g/m².

[0008] In arrangements of a coating or sizing section of a fiber web production line, in which section the coating or sizing medium is applied on the fiber web by spray means nozzles or nozzle units of a spray coating or sizing unit are used, which are as known from prior art attached to a distributor pipe that extends in cross direction over the width of the fiber web and that delivers the treatment substance to the nozzles, which are located at cross direction of the web at a distance to each other such that desired coverage of the treatment substance on the fiber web is achieved. The nozzles in prior art arrangements operate on continuous bases as long as treatment substance is supplied from the distribution pipe and the amount of treatment substance supply is defined by feed pressure and selection of nozzle size. The coverage of one nozzle is typically 300 mm at horizontal axis. With 50 mm distribution of the nozzles a six-fold coverage is achieved, when the nozzles are at angle and thereby the applied treatment substance spray is not disturbed by side by side at intervals located nozzles. Typically also the nozzles near and/or next to the edges of the fiber web also apply treatment substance over the edges of the fiber web in order to achieve full coverage in the whole width i.e. in cross direction of the fiber web.

[0009] In some production lines the width of the fiber web is varied even 20 times a day due to production of different grades of fiber webs or due to need of fiber web of different widths for further processing or end usages. Typically trimming of the fiber web is positioned symmetrically but sometimes an unsymmetrical trimming is used for example due to threading reasons or due to poorer quality of one edge of the fiber web than the other edge of the fiber web. The variation of the width of the fiber web can be even 33%.

[0010] Due to the variation of the width of the web in

treatment substance application from the edge most nozzles spray the treatment substance also over the edges more than required for the total coverage of the fiber web. Thus treatment substance is wasted and cleaning needs are increased.

[0011] In some cases possibility of adjusting the total width of the treatment substance application in cross-direction of the web is needed. Also in some cases exists a need to adjust the amount of a group of nozzles, especially a group of nozzles located next to an edge of the fiber web. In prior art arrangements this has been arranged by changing the whole nozzle system comprising the distribution pipe and the nozzles etc. to a system with required width or by changing the nozzles of the required group. Especially in some cases there even exists a need to adjust the treatment substance spraying width during the running of the production. This has not been possible in prior art arrangements.

[0012] An object of the invention is to provide an arrangement of a fiber web production line and a method of a fiber web production line in which problems and disadvantages especially relating to adjusting the width of the treatment system spraying in cross direction of the fiber web are eliminated or at least minimized.

[0013] Further objects of the invention is to provide an arrangement of a fiber web production line and a method of a fiber web production line in which new possibilities of amount adjusting of the treatment substance in cross direction of the fiber web, especially at edge areas of the fiber web are available.

[0014] In order to achieve the above objects the arrangement according to the invention is mainly characterized by the features of claim 1 and the method according to the invention is mainly characterized by the features of claim 10.

[0015] According to an advantageous aspect of the invention the arrangement of a coating or sizing section of a fiber web production line, in which section a treatment substance, in particular a coating or sizing medium, is applied onto the fiber web by spraying, which arrangement comprises nozzles located in at least one nozzle row extending in cross-direction i.e. in width direction of the fiber web for spraying the treatment substance onto the fiber web and the nozzles comprise continuous operating nozzles located at least in the middle of the nozzle row and adjustable or closable nozzles located at least at one end of the row i.e. supplying treatment substance to the corresponding edge area of the fiber web.

[0016] In this description and claims by continuous operating nozzles are meant nozzles that supply treatment substance onto the fiber web, when treatment substance is supplied and which have no individual adjusting or closing means. In this description and claims by adjustable or closable nozzles are meant nozzles that can individually at least be closed in respect of the treatment substance supply or they can also have individual adjusting possibility in respect of the amount of treatment substance to be supplied.

[0017] Advantageously the arrangement comprises adjustable or closable nozzles at both ends of the nozzle row i.e. at locations corresponding to the edge areas of the fiber web.

5 **[0018]** According to an advantageous feature 10 - 40 % of all nozzles are adjustable or closable nozzles advantageously evenly located at locations corresponding to both edge areas of the fiber web.

10 **[0019]** Advantageously the adjustable or closable nozzle comprises a valve, which can be an automatic valve or a manual valve. The valve can be adjustable or on-off valve. The valve can also be a tri-pass valve. The valve can be located near the nozzle or in a farther location in the corresponding piping of the nozzle.

15 **[0020]** Advantageously the arrangement forms a module that is detachably fastened to the frame work of the treatment substance spraying device.

20 **[0021]** According to an advantageous aspect of the invention the method of a coating or sizing section of a fiber web production line, in which method a treatment substance, in particular a coating or sizing medium, is applied onto the fiber web by spraying by nozzles located in at least one nozzle row extending in cross-direction i.e. in width direction of the fiber web for spraying the treatment substance onto the fiber web, and in the method the treatment substance is supplied by continuously operating nozzles located at least in the middle of the nozzle row supplying treatment substance onto the middle parts of the fiber web in cross direction and by adjustable or closable nozzles located at least at one edge area of the row i.e. supplying treatment substance to the corresponding edge area of the fiber web.

25 **[0022]** Advantageously in the method the adjustable or closable nozzles are closed when they are not needed while the continuously operating nozzles apply treatment substance onto the fiber web.

30 **[0023]** According to another advantageous feature of the method cleaning liquid and/or rinsing water is led through the adjustable or closable nozzles before they are closed.

35 **[0024]** According to another advantageous feature of the method cleaning liquid and/or rinsing water is led through the adjustable or closable nozzles while the continuously operating nozzles apply treatment substance onto the fiber web.

40 **[0025]** Advantageously the cleaning liquid and/or rinsing water amount supplied to the nozzles is small, advantageously 0,1 - 1,5 l/min/nozzle.

45 **[0026]** By the invention the total width of treatment substance spraying can be controlled in cross direction of the fiber web and additionally at edge areas of the fiber web the amount of treatment substance can be controlled. For example the amount of the treatment substance to be sprayed can be adjusted to be lower than in the other nozzles. By the invention it is also possible to adjust smaller the amount of the treatment substance to be sprayed by the nozzles near and/or next to the edges of the fiber web, which apply treatment substance over the

edges of the fiber web in order to achieve full coverage in the whole width i.e. in cross direction of the fiber web. **[0027]** In the following the invention is explained in more detail with reference to the accompanying drawing in which

Figure 1 shows as side projection one schematical example of prior art.

Figures 2 - 5 show schematically advantageous examples of the invention.

[0028] In the figures the corresponding elements, parts and part components of the arrangement are denoted by same reference signs in the figures unless otherwise mentioned.

[0029] In figure 1 is shown side projection one schematical example of prior art arrangement of spraying device for applying treatment substance on a moving fiber web W. The spraying device according to prior art comprises a distributor pipe 13 extending in cross direction over the width of the fiber web W. The distributor pipe 13 comprises several at a distance in the cross direction spaced apart from each other located continuously operating nozzles 11 in one row, which continuously nozzles 11 creating one nozzle row are typically supported by a support element 25 extending in the cross direction of the fiber web W. Into all continuously operating nozzles 11 the treatment substance is supplied from the distributor pipe 13 via channels 18. The continuously operating nozzles 11 in the one nozzle row do not necessarily need to be on straight line. The center lines of the nozzles, in particular for different distribution pipes, can be offset +/- 20 mm in the nozzle row, advantageously +/- 10 mm. The offset depends on distribution of the nozzles and on

desired coverage of the treatment substance on the fiber web. **[0030]** In figures 2 - 5 is shown advantageous examples of an arrangement of a spraying device for applying treatment substance on a moving fiber web W according to the invention. The arrangement comprises a distribution pipe 13 and continuously operating nozzles 11 and a channel 18 to corresponding continuously operating nozzle 11 from the distribution pipe 13 for supplying the treatment substance. According to the invention the arrangement comprises also adjustable or closable nozzles 12 that are connected to the distribution pipe 13 by channels 17. For each adjustable or closable nozzle 12 a valve 15 is arranged in the channel 17 for adjusting or closing the treatment substance supply to corresponding adjustable or closable nozzle 12. Advantageously the adjustable or closable nozzles 15 are located at both edge areas of the fiber web but the adjustable or closable nozzles 12 can also be located at one of the edge areas of the fiber web W, only. Advantageously 10 - 40 % of all nozzles 11, 12 are adjustable or closable and evenly located at both edge areas of the fiber web W. Each of the adjustable or closable nozzles 12 comprises a valve 15,

which can be an automatic valve or a manual valve or adjustable valve or on-off valve. The valve 15 can also be a tri-pass valve, figure 5. The valve 15 can be located near the nozzle 12, as shown in the figure 2 or in a farther location in the corresponding channel 17 of the nozzle 12. Advantageously each adjustable or closable nozzle has its own valve but the valve can also be located in the corresponding channeling to adjust or close several adjustable or closable valves simultaneously.

[0031] In the examples of figures 2 and 3 in the arrangement the cleaning liquid, advantageously rinsing water is first led through the distribution pipe 13 and through all nozzles 11, 12, i.e. including the adjustable or closable nozzles 12 and then the adjustable or closable nozzles 12 are closed and thereafter the treatment substance applying is continued at the desired width through the nozzles 11 and possibly selected adjustable or closable nozzles 12.

[0032] In the examples of figures 4 and 5 the cleaning of the adjustable or closable nozzles 12 is provided while the other nozzles 11 are spraying treatment substance i.e. during the running of production. In the example of figure 4 the valves 15 of the adjustable or closable nozzles 12 have their own distribution pipe 14 through which in addition to the treatment substance also the cleaning liquid or rinsing water can be fed without interrupting the treatment substance supply to the other nozzles 11 from the distribution pipe 13. After the cleaning the valves 12 can be closed or they can spray water during the operation of the other valves 11. In the example of figure 5 tri-pass valves are used as valves for the adjustable or closable valves 15 and thus they 15 are provided with separate cleaning liquid and/or rinsing water channels 19 from a distribution channel 16 for the cleaning liquid and/or the rinsing water. The cleaning liquid or rinsing water is fed without interrupting the treatment substance supply to the other nozzle 11. After the cleaning the valves can be closed or they can spray water during the operation of the other valves.

[0033] Examples in figure 4 and 5 can be easily combined to create yet another example of the invention, in which the arrangement the adjustable or closable nozzles have their own distribution pipe 14 and separate cleaning liquid and/or rising water channels 19 connected to a distribution channel 16 for cleaning liquid and/or rising water.

Reference signs used in the drawing:

[0034]

- 11 continuously operating nozzle
- 12 adjustable or closable nozzle
- 13 distribution pipe
- 14 distribution pipe for adjustable or closable nozzles

- 15 valve
- 16 distribution channel for the cleaning liquid and/or rinsing
- 17 channel to an adjustable or a closable nozzle
- 18 channel to a continuously operating nozzle
- 19 cleaning liquid channel
- 25 support element
- W web

Claims

1. Arrangement of a coating or sizing section of a fiber web production line, in which section a treatment substance, in particular a coating or sizing medium, is applied onto the fiber web by spraying, which arrangement comprises nozzles (11, 12) located in at least one nozzle row extending in cross-direction i.e. in width direction of the fiber web (W) for spraying the treatment substance onto the fiber web (W), **characterized in that** the nozzles (11, 12) comprise continuous operating nozzles (11) located at least in the middle of the nozzle row and adjustable or closable nozzles (12) located at least at one end of the row.
2. Arrangement according to claim 1, **characterized in that** continuous operating nozzles (11) are nozzles that supply treatment substance onto the fiber web (W), when treatment substance is supplied and which have no individual adjusting or closing means.
3. Arrangement according to claim 1, **characterized in that** adjustable or closable nozzles (12) are nozzles that can individually at least be closed in respect of the treatment substance supply or they can also have individual adjusting possibility in respect of the amount of treatment substance to be supplied.
4. Arrangement according to any of claims 1 - 3, **characterized in that** the arrangement comprises adjustable or closable nozzles (12) at both ends of the nozzle row.
5. Arrangement according to any of claims 1 - 4, **characterized in that** 10 - 40 % of all nozzles (11, 12) are adjustable or closable nozzles (12) advantageously evenly located at locations corresponding to both edge areas of the fiber web (W).
6. Arrangement according to any of claims 1 - 4, **characterized in that** each adjustable or closable nozzle

(12) comprises a valve (15).

7. Arrangement according to claim 6, **characterized in that** the valve (15) is an automatic valve or a manual valve.
8. Arrangement according to claim 6 or 7, **characterized in that** the valve is adjustable or on-off valve or a tri-pass valve.
9. Arrangement according to any of claims 1 - 8, **characterized in that** the arrangement forms a module that is detachably fastened to the frame work of the treatment substance spraying device.
10. Method of a coating or sizing section of a fiber web production line, in which method a treatment substance, in particular a coating or sizing medium, is applied onto the fiber web (W) by spraying by nozzles (11, 12) located in at least nozzle row extending in cross-direction i.e. in width direction of the fiber web for spraying the treatment substance onto the fiber web, **characterized in that** in the method the treatment substance is supplied by continuously operating nozzles (11) located at least in the middle of the nozzle row i.e. supplying treatment substance onto the middle parts of the fiber web (W) in cross direction and by adjustable or closable nozzles (12) located at least at one end of the nozzle row i.e. supplying treatment substance to the corresponding edge area of the fiber web (W).
11. Method according to claim 10, **characterized in that** in the method the adjustable or closable nozzles (12) are closed when they are not needed while the continuously operating nozzles (11) apply treatment substance onto the fiber web.
12. Method according to claim 11, **characterized in that** in the method cleaning liquid and/or rinsing water is led through the adjustable or closable nozzles (12) before they are closed.
13. Method according to claim 12, **characterized in that** in the method cleaning liquid and/or rinsing water is led through the adjustable and/or closable nozzles (12) while the continuously operating nozzles (11) apply treatment substance onto the fiber web (W).
14. Method according to claim 10, **characterized in that** the cleaning liquid, advantageously rinsing water is first led through all nozzles (11, 12) and then the adjustable or closable nozzles (12) are closed and thereafter the treatment substance applying is continued at the desired width through the continuously operating nozzles (11) and selected adjustable or closable nozzles (12).

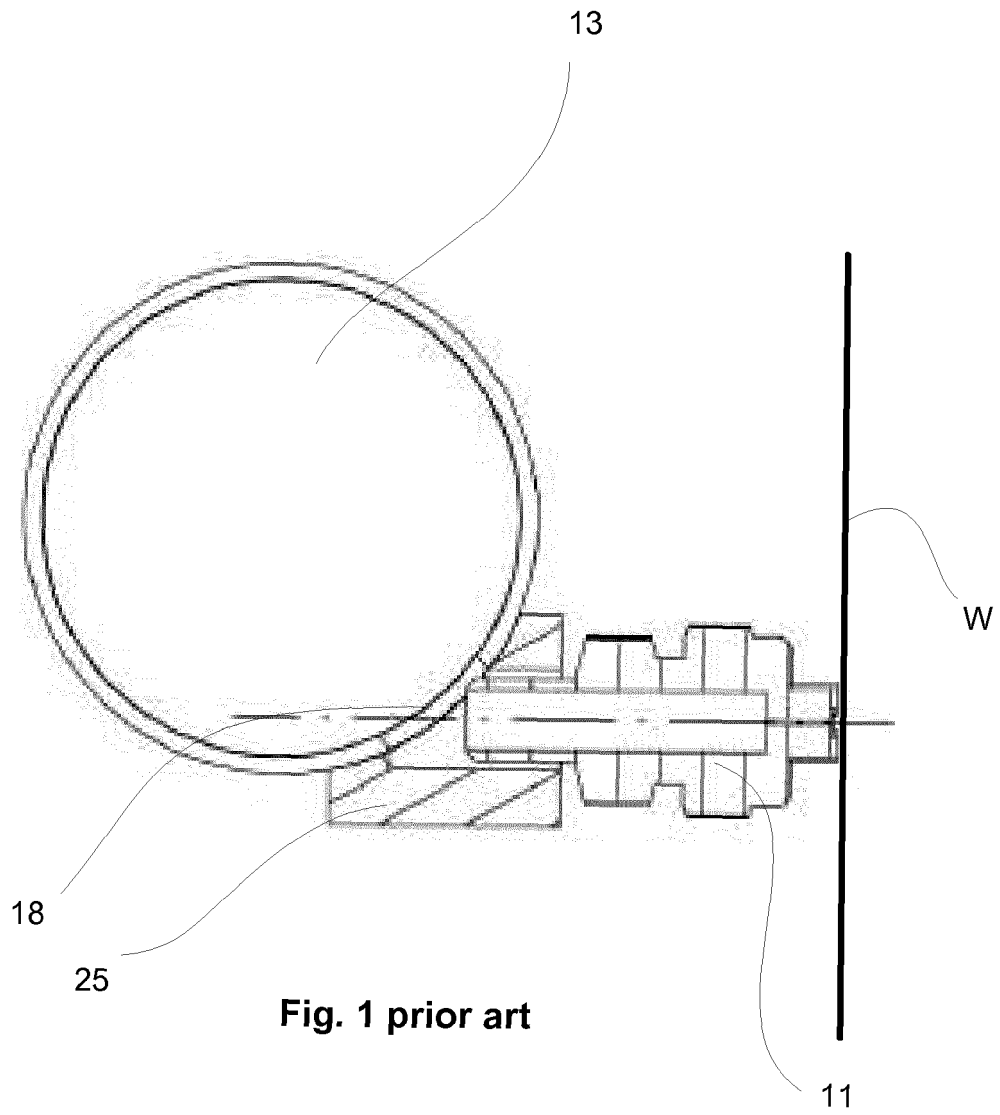


Fig. 1 prior art

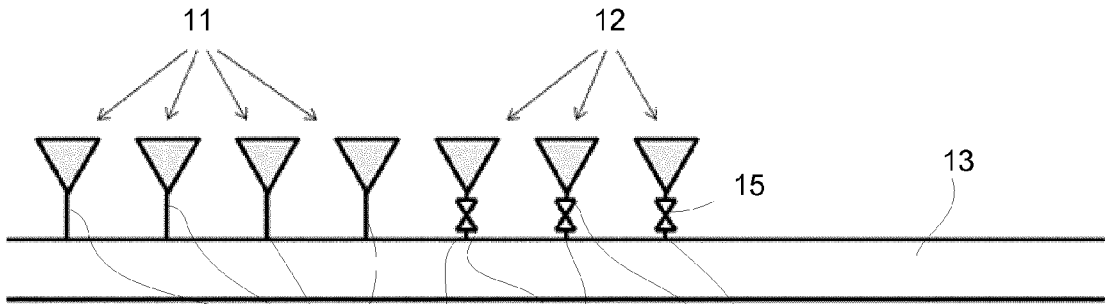


Fig. 2

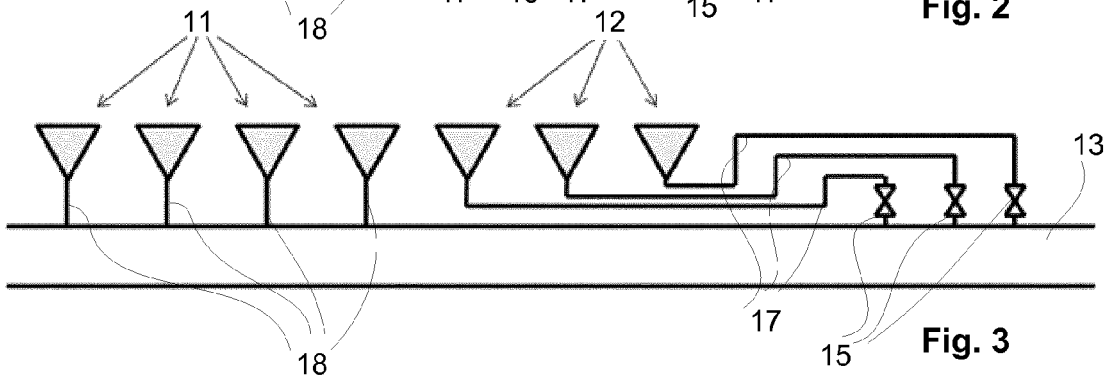


Fig. 3

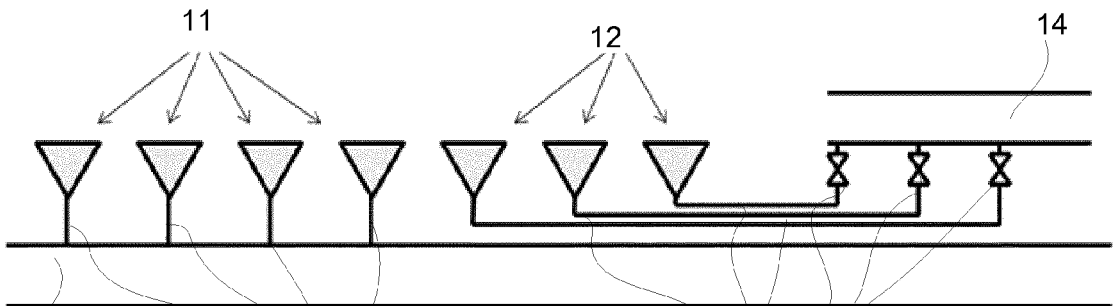


Fig. 4

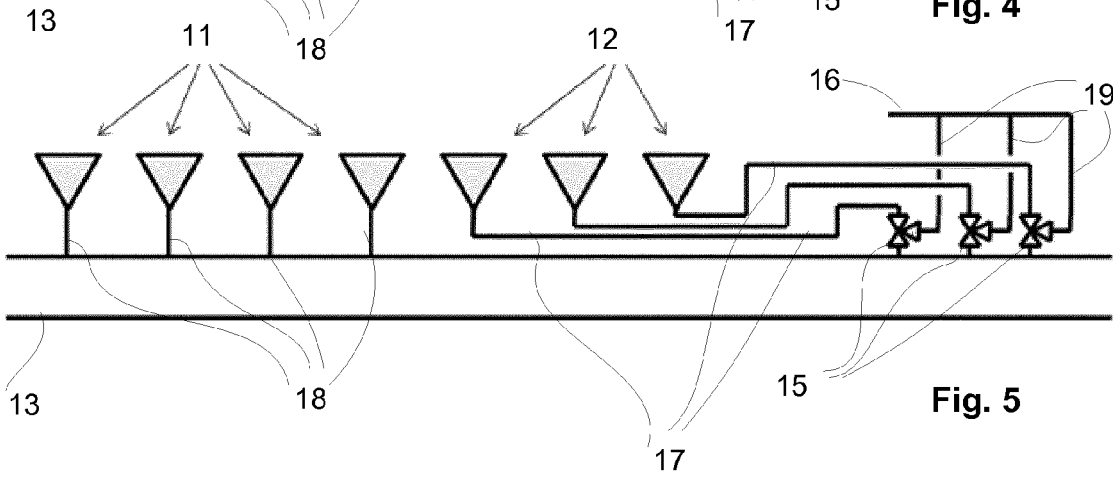


Fig. 5



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