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(54) **PLANT FOR PRODUCING NONWOVEN FABRIC**

(57) Plant for producing nonwoven fabric, which comprises a main channel (3) susceptible of being traversed by extruded filaments (F) for forming a nonwoven fabric, and a cooling station (8), which defines, in the main channel (3), a cooling channel (9). The cooling station (9) is composed of two pairs of superimposed chambers (100, 120) placed on opposite sides of the cooling channel (9), and of a common homogenization chamber (90) in which the air coming from the two superimposed

chambers (100, 120) converges. In each chamber, a plurality of homogenizing plates (80) is provided while in the common chamber (90) a straightener panel is provided preceded by further homogenizing plates (93). The ratio between the first section (S1) of the upper first chamber (100) and the second section (S2) of the lower second chamber (120) is comprised between 3/6 and 5/6 and preferably is approximately 4/6.

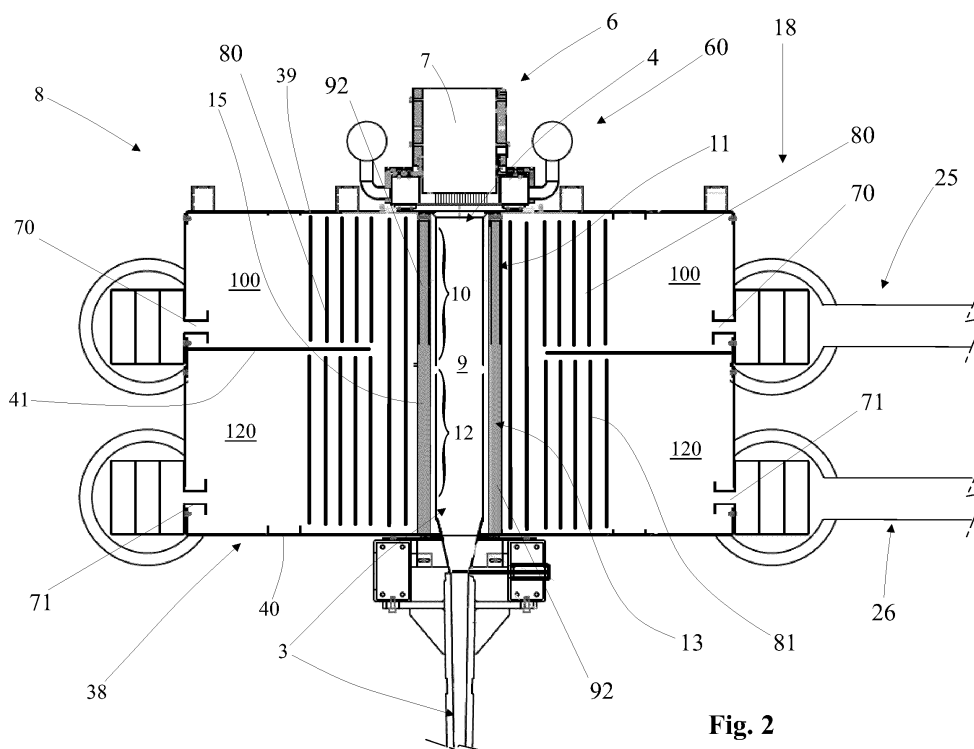


Fig. 2

Description

Field of application

[0001] The present invention regards a plant for producing nonwoven fabric, in particular made of plastic material, according to the preamble of the independent claim number 1.

[0002] The present plant for producing nonwoven fabric is intended to be advantageously employed in the field of production of fiber webs adapted to form a nonwoven fabric, normally web-like.

[0003] In particular, the plant for producing nonwoven fabric, object of the present invention, is advantageously employable for producing a continuous web of semifinished nonwoven fabric, intended to undergo subsequent transformations in order to obtain a finished product.

[0004] Such webs are normally used for producing sanitary products, such as caps, masks and gloves or in the agriculture field for producing nonwoven fabric intended to be set on the ground to be cultivated, in order to remedy the formation of weeds and/or to protect seeds.

[0005] The invention is therefore inserted in the industrial field of production of web-like material of nonwoven fibers, or more generally in the field of production of nonwoven fabric.

State of the art

[0006] It has been known for some time, in the field of production of fiber webs made of plastic material, to produce nonwoven fabric, such as for example spunbond of polypropylene, polyester, polyethylene and/or other polymers, in particular for producing bandages, gauzes, caps, masks and other sanitary products, or for example for producing nonwoven fabric intended to be used in the agriculture field for covering ground to be cultivated.

[0007] More generally, the nonwoven fabric is a semifinished product intended to sustain successive working steps for producing products of various type, normally made of plastic material and with web form or with web superimposition. Such webs are formed by filaments placed in a random manner in layers and usually joined in a mechanical manner, or by means of adhesives or at least partially melted by means of heat.

[0008] In the aforesaid technical field of production of nonwoven fabric, plants for producing nonwoven fabric have been known for some time, which normally provide for forming a plurality of filaments of plastic material, which are stretched, laid on a conveyor belt and then pressed on each other in order to form the aforesaid nonwoven fabric webs. The plants for producing nonwoven fabric generally comprise a main channel, along which different operating stations are vertically provided for producing the aforesaid filaments of plastic material.

[0009] On the upper part, a station is provided for extruding a plurality of filaments of plastic material at high temperature, which are introduced within the main chan-

nel through an upper inlet mouth, at which an extrusion head is placed, from which the filaments exit on the lower part. For such purpose, such extrusion head is provided on the lower part with a plurality of holes facing the upper inlet opening, from which a mass of melted plastic material exits in the form of filaments.

[0010] The filaments are normally extruded in the form of pasty plastic material, at high temperature, normally comprised between 150°C and 280°C.

[0011] On the lower part, a cooling station is provided (known with the term "quenching" in the technical jargon of the field), in which an air flow is forcibly introduced within the main channel, by means of at least one fan placed outside the latter.

[0012] The air flow introduced into the cooling station cools the filaments that have formed upon exiting the extrusion head of the extrusion station.

[0013] The cooling station comprises lateral walls, normally metallic, which define a cooling channel at a first section of the main channel, within which the high-temperature filaments start to cool.

[0014] In accordance with a known plant, the cooling station comprises at least one chamber, in communication with the cooling channel for the filaments, fed with an air flow from a feed duct intercepted by ventilation means which force the air to pass through a heat exchanger.

[0015] In the chamber of the cooling station, homogenizing plates and a straightener panel are housed, respectively for homogenizing the air over the entire section of the chamber and correctly directing it towards the cooling channel that is traversed by the extruded hot filaments.

[0016] In order to improve the air distribution, plants are known for producing nonwoven fabric provided with a cooling station comprising an upper chamber fed by means of a first air flow, and an equivalent lower chamber fed with a second air flow.

[0017] One example of such plant embodiment is described in the patent EP 3575469. In accordance with such solution, in each chamber a flow straightener panel is provided as well as multiple homogenizing plates for homogenizing the cooling air flow introduced into the chambers.

[0018] In practice, it was observed that even if the latter plant solution has demonstrated that is improved regarding the air distribution over the filaments, due to an improved homogenization and to an improved air directing, the same solution does not lack drawbacks.

[0019] Indeed, this solution has in turn demonstrated that it is unable to ensure a sufficient homogenization for the entire air flow of the two cooling chambers.

[0020] In addition, the two different air flows that intercept the homogenizing plates and hence the straightener panel reach the filaments, defining an excessive discontinuity of treatment that negatively stresses the same filaments.

[0021] Rather, it would be desirable that the air that

enters into the cooling channel of the filaments, even if controlled in the two chambers with two different flows, is not susceptible of excessively stressing the filaments in the passage from the higher flow to the lower one.

[0022] The patent application EP 3690086 A1 describes a further plant of known type, in which the upper chamber and the lower chamber of the cooling station are separated by a horizontal partition wall which terminates several millimeters before a straightener panel placed within the main channel.

[0023] Also the latter solution of known type, however, is unable to optimize the distribution of the air within the main channel in the best possible manner.

Presentation of the invention

[0024] In this situation, the problem underlying the present invention is therefore that of overcoming the drawbacks manifested by the plants for producing nonwoven fabric of known type, by providing a plant for producing nonwoven fabric, which allows obtaining an improved distribution of the cooling gas in the cooling station.

[0025] A further object of the present invention is to provide a plant for producing nonwoven fabric in which the air for cooling the extruded filaments is adjustable in an easy and precise manner.

[0026] A further object of the present invention is to provide a plant for producing nonwoven fabric which is simple and reliable in operation.

Brief description of the drawings

[0027] The technical characteristics of the invention, according to the aforesaid objects, can be clearly seen in the contents of the below-reported claims and the advantages thereof will be more evident in the following detailed description, made with reference to the enclosed drawings, which represent a merely exemplifying and non-limiting embodiment of the invention, in which:

- figure 1 shows a schematic front view of a plant for producing nonwoven fabric, object of the present invention;
- figure 2 shows a schematic front view of a detail of the plant for producing nonwoven fabric illustrated in figure 1, regarding the cooling station;
- figure 3 shows a schematic front view of a detail of the plant for producing nonwoven fabric illustrated in figure 1, regarding part of cooling means of the cooling station;
- figure 4 shows a schematic front view of a detail of the plant for producing nonwoven fabric illustrated in figure 1, regarding the cooling station with two superimposed chambers;
- figure 5 shows a perspective view of a detail of the cooling station of figure 4 relative to a homogenizing plate.

Detailed description of a preferred embodiment

[0028] With reference to the enclosed drawings, reference number 1 overall indicates a plant for producing nonwoven fabric, according to the present invention.

[0029] This is intended to be employed for producing nonwoven fabric of different type and material, such as in particular spunbond made of plastic material, e.g. polypropylene and/or polyethylene, and in particular polyethylene terephthalate (PET in the technical jargon of the field).

[0030] Hereinbelow, reference will be made to a plant 1 for producing nonwoven fabric made of plastic material, in accordance with the preferred embodiment illustrated in the enclosed figures. Nevertheless, the plant 1 of the present invention can also be advantageously employed for producing nonwoven fabric of another type, per se well known to the man skilled in the art and therefore not described in detail hereinbelow. Therefore, hereinbelow with the term "nonwoven fabric", it must be intended a substantially web-like material composed of a plurality of filaments compressed on each other in a substantially random manner.

[0031] In particular, the nonwoven fabric is normally composed of a plurality of filaments of plastic material joined together by means of a mechanical action, e.g. by means of crushing.

[0032] With reference to the example of figure 1, the plant 1 for producing nonwoven fabric comprises, in a per se conventional manner, a support structure 2 (illustrated schematically in figure 1) provided with a main channel 3 extended along a vertical axis Y from an upper inlet mouth 4 for the introduction of filaments F for forming a nonwoven fabric to a lower outlet mouth 5 for the expulsion of the filaments F, e.g. on a conveyor belt.

[0033] Advantageously, the support structure 2 is intended to be abutted against the ground and preferably is made of metallic material, such as for example stainless steel, such as for example AISI 304 steel or AISI 431 steel.

[0034] The plant 1 advantageously comprises a feed station 6 placed above the main channel 3 and in communication with the inlet mouth 4 of the latter in order to introduce, into the main channel 3, filaments F for forming a nonwoven fabric.

[0035] Preferably, the feed station 6 comprises an extruder supported by the support structure 2 and provided with an extrusion head 7 having an extrusion plate facing towards the inlet mouth 4 of the main channel 3.

[0036] The extrusion plate of the extrusion head 7 of the feed station 6 is advantageously provided with a plurality of through holes, susceptible of being traversed by the flow of melted plastic material generated by the extruder, in order to form the filaments F. The filaments F are normally extruded in pasty plastic material, at high temperature, normally comprised between 150°C and 280°C (per se well known to the man skilled in the art and therefore not described in detail hereinbelow).

[0037] In operation, the filaments F thus formed pass through the inlet mouth 4, entering into the main channel 3 in order to allow a processing thereof through a plurality of operating stations, which will be described in detail hereinbelow.

[0038] The plant 1 also comprises a cooling station 8, which is placed along the main channel 3 below the inlet mouth 4. The cooling station 8 defines, in the main channel 3 itself, a section which hereinbelow will be called cooling channel 9.

[0039] Advantageously, the cooling channel 9 therefore corresponds with a longitudinal section of the main channel 3. As discussed in detail hereinbelow, in the cooling channel 9, a cooling gas is susceptible of being forcibly introduced (e.g. an air flow, to which reference will be made hereinbelow) for cooling the filaments F coming from the outlet of the extrusion head 7 of the feed station 6.

[0040] Advantageously, with reference to the example of figure 1, the plant 1 also comprises, in a per se known conventional manner and not the object of the present invention, an elongation station 50 placed, along the main channel 3, below the cooling station 8, in order to elongate the filaments 7 coming from the latter.

[0041] Below the outlet mouth 5 of the main channel 3, a deposition zone (not illustrated) is arranged which is adapted to receive the filaments exiting from the stretching duct 51 and defined for example by a conveyor belt. The deposition zone therefore remains defined as the area of an abutment surface that faces the outlet mouth 5 of the main duct 3.

[0042] Preferably, the plant 1 also comprises a monomer suction station 60 placed at the inlet mouth 4 of the main channel 3, comprising suction means (not illustrated), which are in fluid communication with the main channel 3 in order to suction a suction flow.

[0043] More in detail, the monomer suction station 60 is configured for expelling from the main channel 3, by means of the suction flow, the fumes produced during the extrusion of the plastic material by the extrusion head 7, through a stack (not illustrated) connected to the outside environment.

[0044] More in detail, the monomer suction station 60 comprises at least one expulsion duct 61 connected to the main channel 3, at the extrusion plate of the extrusion head 7, in order to convey the fumes produced by the latter towards the aforesaid stack.

[0045] The expulsion duct is adapted to convey the fumes and the vapors produced by the melted plastic material, extruded into the filaments F by the extrusion head 7, which could adhere to the internal walls of the main channel 3, forming encrustations.

[0046] More in detail, the abovementioned cooling station 8 comprises two first chambers 100, which are placed opposite, on opposite sides with respect to the cooling channel 9.

[0047] Each of the first chambers 100 is extended height-wise along the vertical axis Y for a first section 10

of the cooling channel 9. In addition, each of the first chambers 100 is extended from the exterior towards the cooling channel 9 with a first section S1, from a first feed mouth 70 to a first delivery opening 11 in fluid communication with the cooling channel 9.

[0048] Advantageously each of the first chambers 100 has substantially horizontal extension with preferably constant section S1.

[0049] The cooling station 8 also comprises two second chambers 120 which are placed opposite, on opposite sides with respect to the cooling channel 9.

[0050] Each of the second chambers 120 is extended height-wise along the vertical axis Y for a second section 12 of the cooling channel 9 below said first section 10; in other words the first chambers 100 and the second chambers 120 are two-by-two superimposed at two opposite sides of the cooling channel 9, for example being separated from each other by a common dividing wall 41.

[0051] In addition each of the second chambers 120 is extended from the exterior towards the cooling channel 9 with a second section S2, from a second feed mouth 71 to a second delivery opening 13 in fluid communication with the cooling channel 9.

[0052] More in detail, the cooling station 8 comprises an internal wall 15 which is extended along the vertical axis Y, laterally delimiting the cooling channel 9. Preferably, the aforesaid internal wall 15 delimits the extension of the cooling channel 9 around the vertical axis Y. For example, such internal wall 15 can comprise multiple sides (e.g. four sides that are two-by-two parallel) which define corresponding longitudinal flanks of the cooling channel 9, in particular parallel to the vertical axis Y.

[0053] Suitably, the internal wall 15 is provided with the abovementioned first and second delivery openings 11, 13 in communication with the first and second chambers 100, 120.

[0054] Advantageously the first and the second delivery openings 11, 13 have width equal to the section of the chambers 100, 120, such that the internal wall 15 is extended only on the two sides adjacent to the opposite delivery openings 11, 13.

[0055] The plant 1, object of the present invention, also comprises a plurality of first and second homogenizing plates 80, 81 which have holes that are uniformly distributed for the passage of air, and are in the form of grids or perforated plates. Such homogenizing plates 80, 81 are respectively housed in each first and second chamber 100, 120.

[0056] In accordance with the idea underlying the present invention, each first and second chamber 100, 120 communicates, by means of the first and second delivery openings 11 and 13 (placed downstream of the same chambers 100, 120 in the flow advancement direction) with a common homogenization chamber 90.

[0057] The latter is connected to the cooling channel 9 by means of a common opening 91 and houses at least one straightener panel 92 susceptible of intercepting the fluid flow directed towards the cooling channel 9 and im-

parting the desired direction thereto, in particular orthogonal to the axis Y of the cooling channel 9.

[0058] Such configuration of the cooling station with a common homogenization chamber 90 placed downstream of the two superimposed chambers 100, 120, has proven particularly recommended for homogenizing the air flow on the filaments and for preventing a stress thereof due to different distributions in the two superimposed chambers 100, 120, in the case of a direct connection of such two chambers 100, 120 with the cooling channel 9. The homogenizing plates 80, 81 advantageously have U-bent edges such to be mounted spaced, one in abutment against the other. In addition, from the common dividing wall 41, an abutment element 75 is projectingly extended for stopping the first of the homogenizing plates 80, 81 of the provided succession of plates.

[0059] The straightener panel 92 can for example be of alveolar type made of aluminum, in which the cells have diameter from 2 to 5 mm and length from 30 to 60 mm with ratio between length and diameter of the cells always greater than 16. For example, the diameter is 3 mm and the length is 50 mm.

[0060] The straightener panel 92 has a face 92', which directly faces the cooling channel 9 and is advantageously substantially aligned with the common opening 91.

[0061] The first and second homogenizing plates 80, 81, housed in the first and second chambers 100, 120, are placed, in each respective chamber 100, 120, in a succession such that the air flow traverses them entirely before reaching the straightener panel 92 and hence entering into the cooling channel 9.

[0062] In each succession of homogenizing plates 80, 81, at least one first plate 8A has open surface comprised between 17 and 27% of its total surface (void with respect to solid) and at least one second plate 8B has open surface comprised between 35 and 40% of its total surface.

[0063] Preferably, such different plates 8A, 8B are alternated with each other with an ABA scheme. In addition, in accordance with a preferred embodiment the air initially encounters multiple second homogenizing plates 8B with open surface comprised between 35 and 40% of its total surface and then at least one first plate 8A with open surface comprised between 17 and 27%. Advantageously, five plates are provided for each chamber 100, 120, of which the first three are second plates 8B followed by a first plate 8A and then once again by a second plate 8B.

[0064] In the aforesaid common homogenization chamber 90, and upstream of the straightener panel 92, also at least one common homogenizing plate 93 is preferably housed, of the above-indicated type and housed in the first and second chambers 100, 120; in particular this will preferably have grid or perforated plate form, but will be extended for the entire overall section of the two superimposed chambers 100, 120.

[0065] Preferably, in the common homogenization chamber 90, two aforesaid common homogenizing plates 93 are housed upstream of the straightener panel

92, which are advantageously one of first plate 8A type with regard to the void over solid ratio (i.e. the open surface) and the other of second plate 8B type with regard to the void over solid ratio (i.e. the open surface).

[0066] The succession of homogenizing plates 80/81, 93 which is defined in the advancement direction of the air flow in each chamber 100, 120 and in the adjacent common homogenization chamber 90 advantageously provides that the first and the second alternated plates 8A, 8B are alternated at least with ABAB sequence.

[0067] The embodiment illustrated in the enclosed figure 4 provides, for each succession, a total of seven homogenizing plates 80/81, 93 of which five 80/81 are in each chamber 100, 120 and two 93 are in the common homogenization chamber 90 hence with an overall BBBABAB sequence, considering with A the first plate 8A and with B the second plate 8B.

[0068] Preferably, each first and second chamber 100, 120 comprises a prechamber 100', 120', placed upstream in the flow advancement sense and a treatment chamber 100'', 120'' placed downstream in the flow advancement sense and with the homogenizing plates 80, 81 housed at the interior. Each prechamber 100', 120' receives the air directly from the feed mouths 70, 71 while the treatment chamber 100'', 120'' communicates directly with the common homogenization chamber 90.

[0069] In accordance with an advantageous embodiment of the present invention, the ratio between the first section S1 of the first chamber 100 and the second section S2 of the second chamber 120 is comprised between 3/6 and 5/6 and preferably is approximately 4/6.

[0070] Advantageously, the air flows into the two first chambers 100 and into the two second chambers 120 can be different, as better specified hereinbelow.

[0071] The plant 1 also comprises cooling means 14, which are in fluid connection with the first and the second chambers 100, 120 through the first and the second feed mouths 70, 71. Such cooling means 14 are adapted to introduce through the first and the second delivery openings 11, 13, in the cooling channel 9, at least one cooling gas (such as air) for cooling the filaments F.

[0072] More in detail, preferably the cooling means 14 comprise a feed duct 16, which is extended between an inlet section 17, which is connected to a fan 20 and an outlet section 18, which is connected to the first and to the second feed mouth 70, 71 of the first and second chamber 100, 120.

[0073] Also provided for is a heat exchanger 19 connected to the feed duct 16 at the inlet section 17 in order to vary the temperature of the cooling gas.

[0074] In operation, the fan 20 is susceptible of making the cooling gas (e.g. air) flow through the heat exchanger 19 and then introduce it into the feed duct 16 in order to bring it to the first and second chambers 100, 120.

[0075] Also advantageously provided for are modulation means 23 placed to intercept the feed duct 16 between the inlet section 17 and the outlet section 18, in order to adjust the flow of the cooling gas.

[0076] More in detail in accordance with one possible embodiment illustrated in the enclosed figures, the fan 20 is a rotary fan, of the type per se well known to the man skilled in the art and therefore not described in detail hereinbelow.

[0077] Advantageously, in accordance with the particular embodiment of figure 1, the fan 20 is interposed between the heat exchanger 19 and the inlet section 17 of the feed duct 16, and is configured for suctioning (under reduced pressure) the cooling gas through the heat exchanger 19 and introducing it (under pressure) into the inlet section 17 of the feed duct 16. In particular, the fan 20 is provided with a suction mouth 21 connected to the heat exchanger 19 and a delivery mouth 22 connected to the inlet section 17 of the feed duct 16.

[0078] Preferably, the heat exchanger 19 is adapted to bring the cooling gas to a constant temperature comprised between 20°C and 30°C and in particular comprised between 22°C and 25°C.

[0079] For such purpose, the heat exchanger 19 is adapted to transfer heat to the cooling gas or to absorb heat from the latter, as a function of the temperature of the cooling gas entering the heat exchanger 19 itself (and which can vary for example according to the temperature of the outside environment). Suitably, the heat exchanger 19 is provided with one or more cooling systems and with one or more heating systems such that it can be arranged in order to absorb or transfer heat as a function of the initial temperature of the cooling gas and of the final temperature that one wishes to obtain.

[0080] Advantageously, the feed duct 16 is divided at its outlet section 18 into at least two separate branches 25, 26 adapted to convey separate flows of cooling gas to the first and second chambers 100, 120. Such branches 25, 26 comprise a first branch 25 (upper), which is connected to the first feed mouth 70 of each first chamber 100, and a second branch 26, which is connected to the second feed mouth 71 of the second chamber 120. In addition, the aforesaid modulation means 23 comprise at least two valves 27, 28 adapted to adjust the flow of the cooling gas into the two aforesaid branches 25, 26 and, therefore, into the corresponding cooling chambers 100, 120.

[0081] More in detail, the modulation means 23 comprise a first valve 27 placed to intercept the first branch 25 of the feed duct 16 and arranged for feeding the first chamber 100 through the first feed mouth 70 with a first flow of the cooling gas.

[0082] In addition, the modulation means 23 comprise a second valve 28 placed to intercept the second branch 26 of the feed duct 16 and arranged for feeding the second chamber 120 through the second feed mouth 71 with a second flow of the cooling gas.

[0083] In particular, the valves 27, 28 of the modulation means 23 are settable and/or can be set for defining, of the corresponding branch 25, 26, a corresponding passage section susceptible of being traversed by the cooling gas, in a manner such to determine the flow of the

cooling gas that traverses the corresponding branch 25, 26. In detail, the valves 27, 28 allow reducing or increasing the corresponding aforesaid passage section, respectively in order to increase or reduce the corresponding flow of the cooling gas.

[0084] In this manner, advantageously, the claimed configuration of the feed duct 16 and of the modulation means 23 allows conveying corresponding flows of the cooling gas into the two cooling sections 10, 12, employing only one fan and by means of a simple sectioning of the feed duct 16, ensuring low energy consumptions and simultaneously a configuration of the plant 1 that is simple and inexpensive to attain.

[0085] Such different flows are therefore homogenized within the chambers 100 and 120 as defined above, in particular conveying into a common homogenization chamber 90 which reduces the gradient between the two flows in the two chambers 100, 120, determining an improved effect on the extruded filament and during cooling in the cooling channel 9.

[0086] Advantageously, the first branch 25 of the feed duct 16 is extended between a first inlet end 30, which is in fluid connection with the inlet section 17 of the feed duct 16, and a first outlet end 31, which is in fluid connection with the first feed opening 11 of the first cooling section 10 of the cooling channel 9. In addition, the second branch 26 of the feed duct 16 is extended between a second inlet end 33, which is in fluid connection with the inlet section 17 of the feed duct 16, and a second outlet end 34, which is in fluid connection with the second feed opening 13 of the second cooling section 12 of the cooling channel 9.

[0087] Advantageously, the two valves 27, 28 can comprise corresponding modulatable shutters, provided with one or more shutters (e.g. in the form of orientable plates) movable in order to modify the passage section of the valve 27, 28 and hence of the corresponding branch 25, 26.

[0088] In particular, the shutter of each valve 27, 28 can be settable or positionable in a manual and/or motorized manner and/or in a permanent or modifiable manner. Advantageously, the first valve 27 and the second valve 28 of the modulation means 23 are arranged in a manner such that the first flow of the cooling gas into the first branch 25 is always greater than the second flow of the cooling gas into the second branch 26. Advantageously, the first flow is greater than the second flow at least by 10% of the value of the latter, and preferably, greater at least by 20%. In particular, the first flow is greater than the second flow by a percentage comprised between about 30% and 100% of the latter.

[0089] For example, the first flow is comprised between 2000 m³/h and 10000 m³/h, and the second flow is comprised between 1000 m³/h and 5000 m³/h (e.g. as a function of the material and of the thickness of the filaments), while always maintaining the first flow greater than the second flow, and advantageously the aforesaid proportions. Advantageously, the valves 27, 28 of the modula-

tion means 23 and the suction means of the monomer suction station 60 are arranged in a manner such that the difference between the first flow in the first branch 25 and the second flow in the second branch 26 is greater than or equal to the suction flow suctioned by the suction means from the main channel 3 and in particular from the cooling channel 9.

[0090] In this manner, it is possible to ensure a pressure stability and simultaneously avoid the formation of turbulence within the main channel 3 at the cooling station 8.

[0091] Indeed, such provision allows for avoiding reduced pressure within the main channel 3, in particular due to the suction of the aforesaid suction means.

[0092] More in detail, the suction flow suctioned from the main channel 3 defines a reduced pressure within the latter at the suction means of the monomer suction station 60. Such reduced pressure leads to an undesired turbulence of the air that flows within the main channel 3.

[0093] Preferably, the air flows in the first chamber 100 and in the second chamber 120 substantially have the same pressure at the time of entering into the cooling channel 9 through the common homogenization chamber 90.

[0094] For example, the pressure in the cooling channel 9 is comprised between 1000 Pa and 17000 Pa, in particular between 1200 Pa and 12000 Pa.

[0095] Advantageously, the pressure in the cooling channel 9 is determined by feedback-controlling the fan 20, by means of the use for example of one or more pressure sensors associated with the cooling channel 9 itself.

[0096] In addition, preferably, the temperature of the first flow is equal to the temperature of the second flow and, in particular, as indicated above comprised between 20°C and 30°C and in particular comprised between 22°C and 25°C.

[0097] Structurally, the above-described cooling station 8 is obtained with a containment body 38 made of metallic plate, which is extended along the vertical axis Y of the main channel 3 between an upper wall 39 and a lower wall 40 which respectively delimit the top and bottom of the first and second chambers 100, 120.

[0098] The containment body 38 comprises, at its interior, a common dividing wall 41, which separates the first chambers 100 and the second chambers 120 from each other. Advantageously, the first and second feed mouths 70, 71 of the first and second chambers 100, 120 are provided on elbow-shaped connectors 85 oriented towards the aforesaid common dividing wall 41 in order to make the distribution of air in such chambers 100, 120 more uniform.

[0099] The invention thus conceived therefore attains the pre-established objects.

Claims

1. Plant (1) for producing nonwoven fabric, comprising:

- a support structure (2) provided with a main channel (3) extended along a vertical axis (Y) from an upper inlet mouth (4) for the introduction of filaments (F) for forming a nonwoven fabric, to a lower outlet mouth (5) for the expulsion of said filaments (F);
- a cooling station (8), which is placed along said main channel (3) below said inlet mouth (4) and delimits, in said main channel (3), a cooling channel (9), said cooling station (8) comprising:

- at least two first chambers (100) that are opposite with respect to said cooling channel (9), each of which is extended along said vertical axis (Y) for a first section (10) of said cooling channel (9), and they are extended from the exterior towards said cooling channel (9) with a first section (S1), from a first feed mouth (70) to a first delivery opening (11) in fluid communication with said cooling channel (9);

- at least two second chambers (120) that are opposite with respect to said cooling channel (9), each of which is extended along said vertical axis (Y) for a second section (12) of said cooling channel (9) below said first section (10), and they are extended from the exterior towards said cooling channel (9) with a second section (S2), from a second feed mouth (71) to a second delivery opening (13) in fluid communication with said cooling channel (9);

- cooling means (14) in fluid connection with said first and second chambers (100, 120) through said first and second feed mouths (70, 71) and adapted to introduce through said first and second delivery mouths (11, 13), in said cooling channel (9), at least one cooling gas for cooling said filaments (F);

said plant (1) comprising a plurality of first and second homogenizing plates (80, 81) respectively housed in each first and second chamber (100, 120);

said plant (1) being **characterized in that** each said first and second chamber (100, 120) communicates downstream by means of said first and second delivery mouths (11, 13) with a common homogenization chamber (90) connected to said cooling channel (9) by means of a common opening (91), said common homogenization chamber (90) housing at least one straightener panel (92) susceptible of intercepting said fluid flow directed towards said cooling channel

- (9);
wherein said plant (1) comprises at least one common homogenization plate (93) housed in said common homogenization chamber (90) upstream of said straightener panel (92). 5
2. Plant (1) according to claim 1, **characterized in that** in said common homogenization chamber (90), two said common homogenizing plates (93) are housed upstream of said straightener panel (92). 10
3. Plant (1) according to any one of the preceding claims, **characterized in that** the ratio between the first section (S1) of said first chamber (100) and the second section (S2) of said second chamber (120) is comprised between 3/6 and 5/6 and preferably is approximately 4/6. 15
4. Plant (1) according to any one of the preceding claims, **characterized in that** said straightener panel (92) is of alveolar type, wherein the cells have diameter from 2 to 5 mm and length from 30 to 60 mm with ratio between length and the diameter of the cells always greater than 16. 20
5. Plant (1) according to any one of the preceding claims, **characterized in that** said homogenizing plates (80, 81) housed in said first and second chambers (100, 120) have open surface comprised between 15 and 40% of its total surface. 25
6. Plant (1) according to claim 5, **characterized in that** said homogenizing plates (80, 81) housed in said first and second chambers (100, 120) are placed in a succession in which at least one first plate (8A), with open surface comprised between 17 and 27% of its total surface, and at least one second plate (8B), with open surface comprised between 35 and 40% of its total surface, are alternated with each other. 30
7. Plant (1) according to claim 6, **characterized in that** said succession of said first and second alternated plates (8A, 8B) within each first and second chamber (100, 120) as well as in the adjacent common homogenization chamber (90) is extended at least with ABAB sequence. 35
8. Plant (1) according to any one of the preceding claims, **characterized in that** said first and second feed mouths (70, 71) are provided on elbow-shaped connectors (85) oriented towards a common dividing wall (41) between said first and second chambers (100, 120). 40
9. Plant (1) according to any one of the preceding claims, **characterized in that** said cooling means (14) comprise:
- a feed duct (16), extended between an inlet section (17) and an outlet section (18), and said outlet section (18) is placed in fluid connection with the first feed opening (11) of said first cooling section (10) and with the second feed opening (13) of said second cooling section (12);
- at least one heat exchanger (19) operatively connected to said feed duct (16) in order to vary the temperature of said cooling gas;
- at least one fan (20) operatively connected to the inlet section (17) of said feed duct (16) and susceptible of making said cooling gas flow through said heat exchanger (19) and through said feed duct (16) from said inlet section (17) towards said outlet section (18);
- modulation means (23) placed to intercept said feed duct (16) between said inlet section (17) and said outlet section (18) and adapted to adjust the flow of said cooling gas. 45
10. Plant (1) according to one of the preceding claims, **characterized in that** said straightener panel (92) has a face (92') which directly faces said cooling channel (9) and is placed substantially aligned with said common opening (91). 50
11. Plant (1) according to one of the preceding claims, **characterized in that** each said first and second chamber (100, 120) comprises a corresponding upstream prechamber (100', 120') and a corresponding downstream treatment chamber (100'', 120'') with said first and second homogenizing plates (80, 81) respectively housed therein. 55

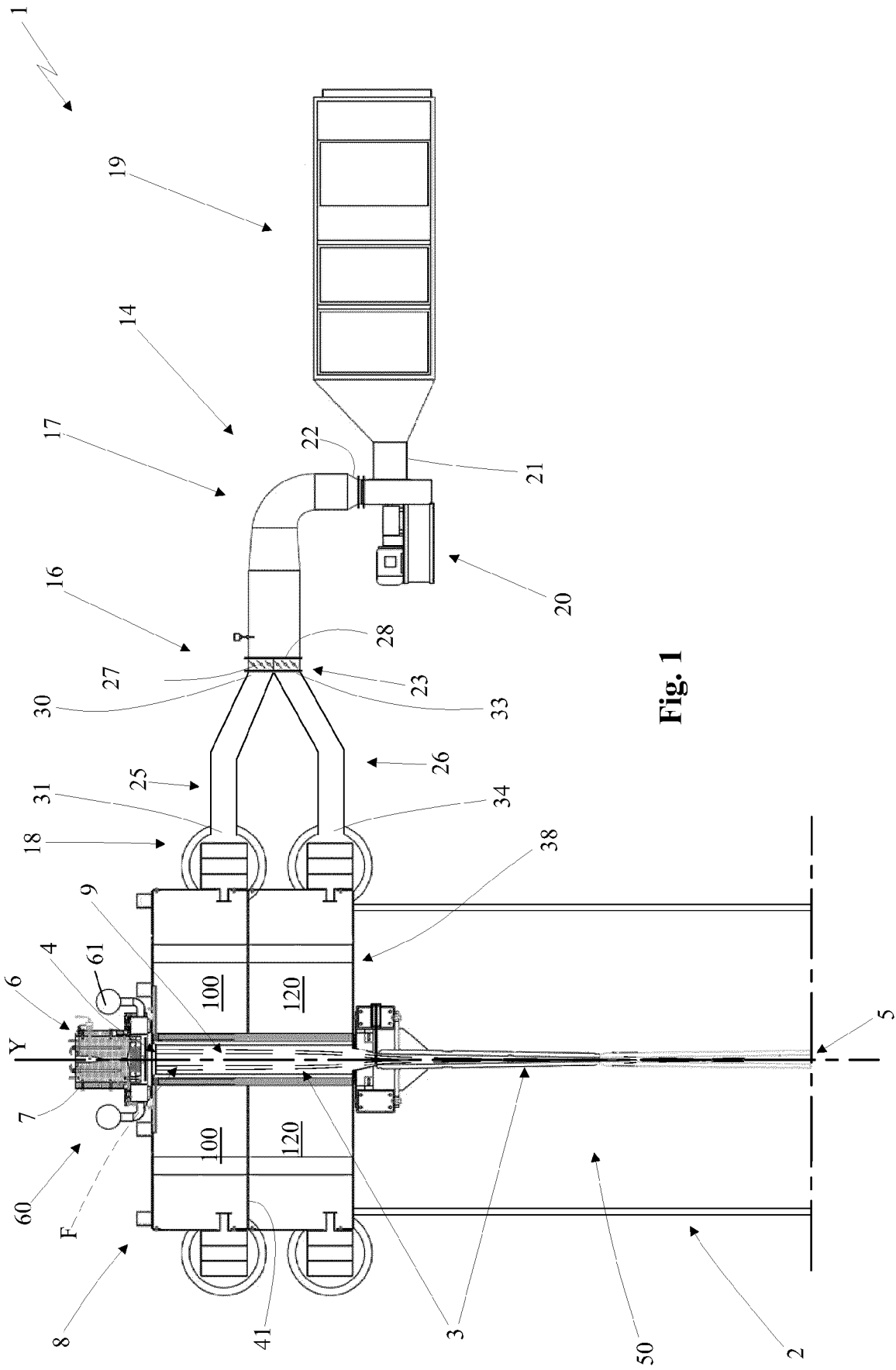
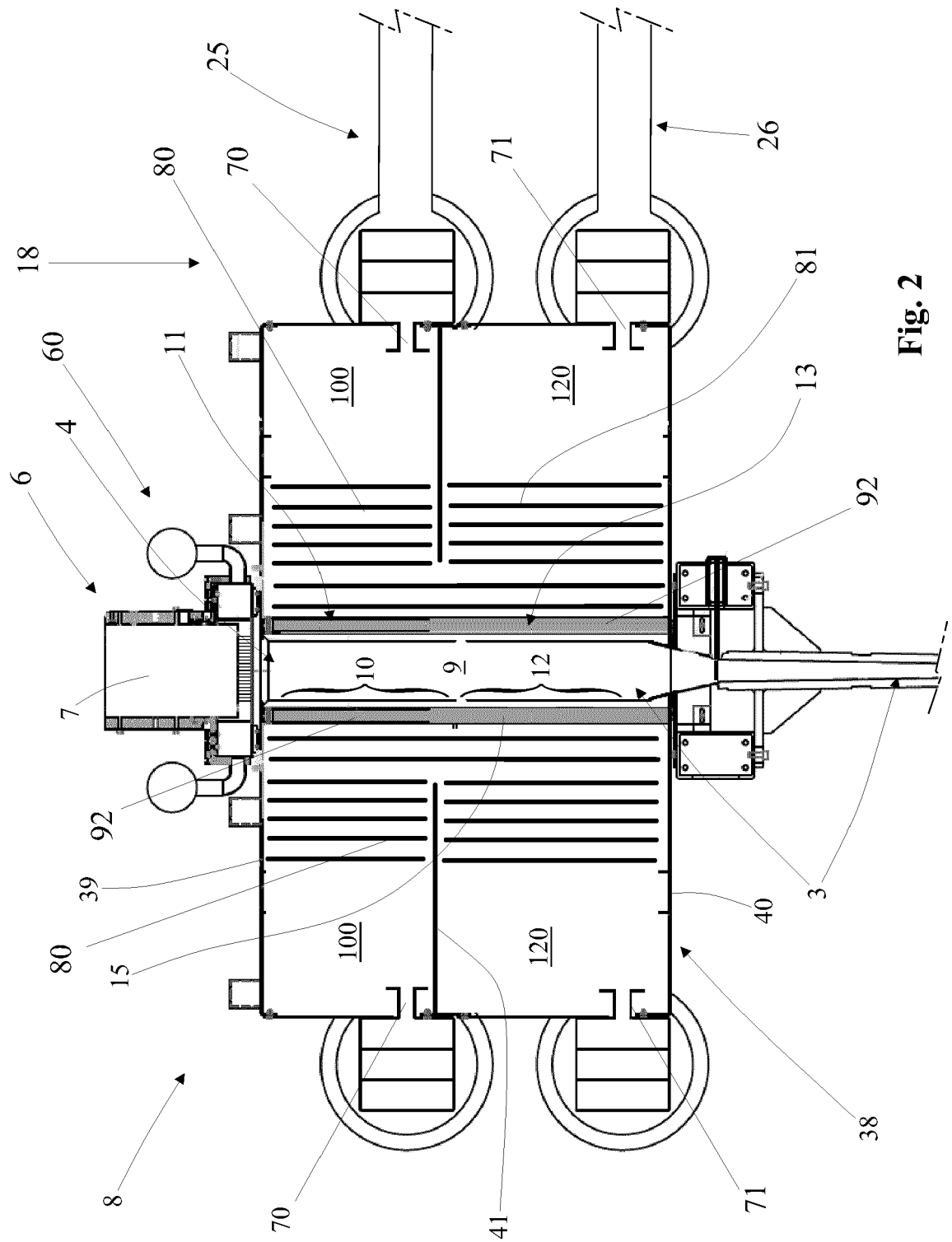


Fig. 1



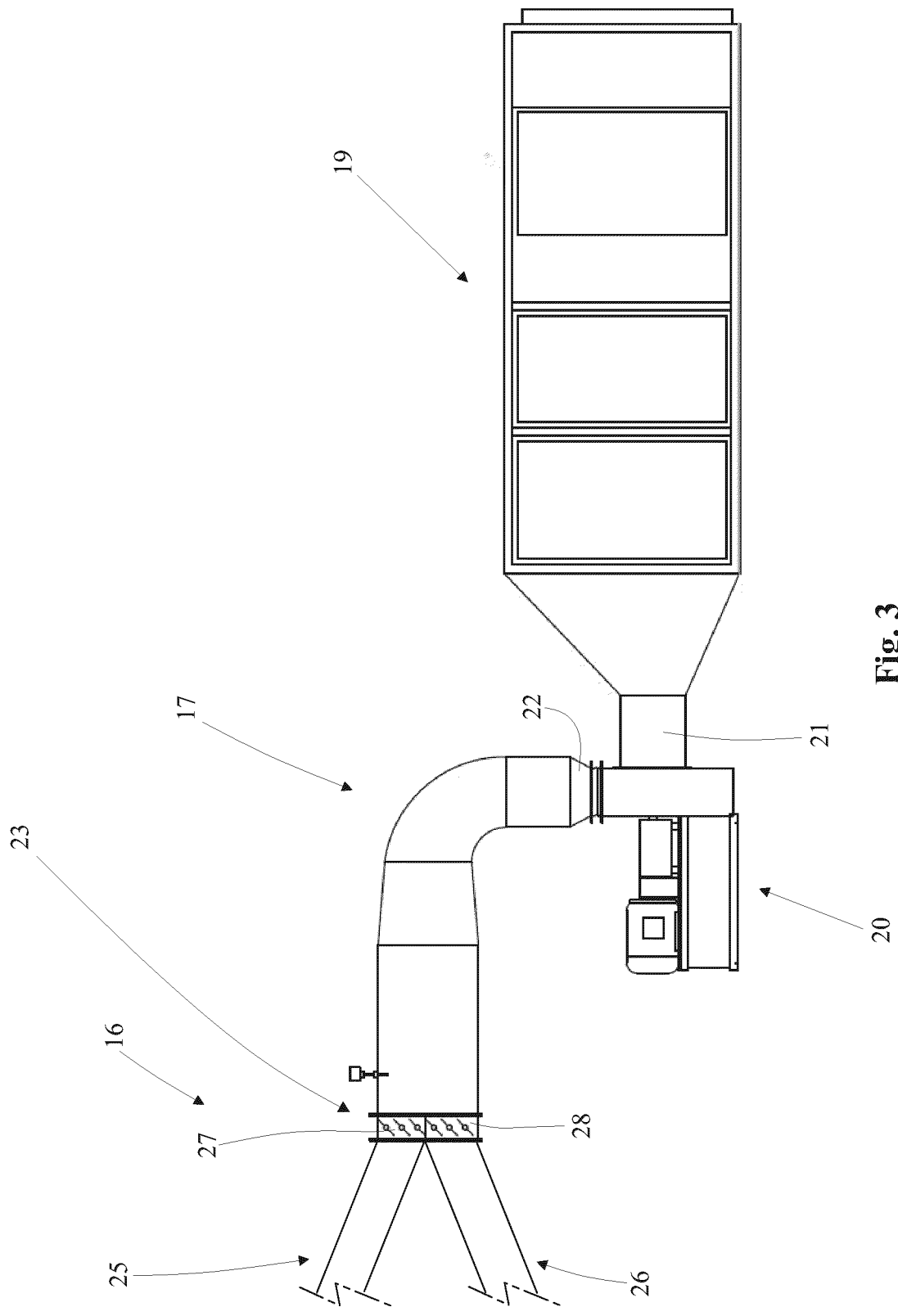


Fig. 3

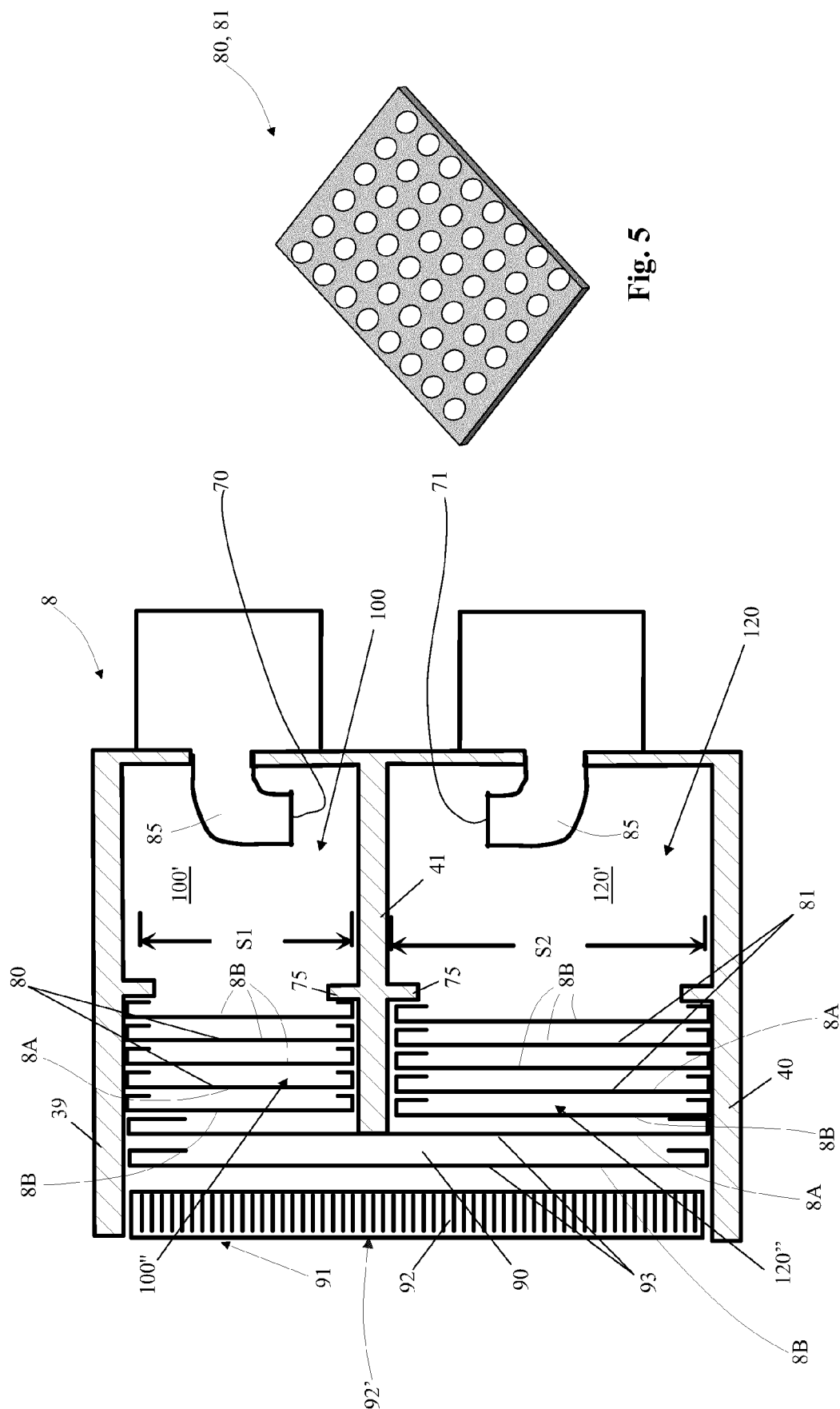


Fig. 4

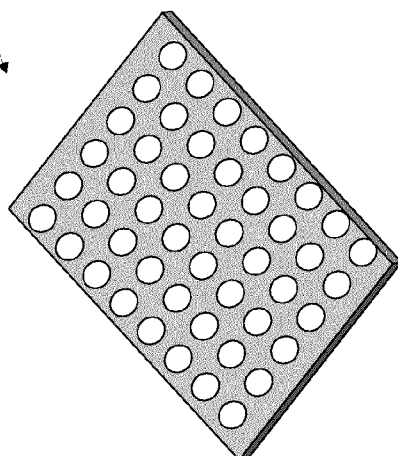


Fig. 5



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