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(71) Applicant: **Fare' S.p.A. a socio unico**
21054 Fagnano Olona (VA) (IT)

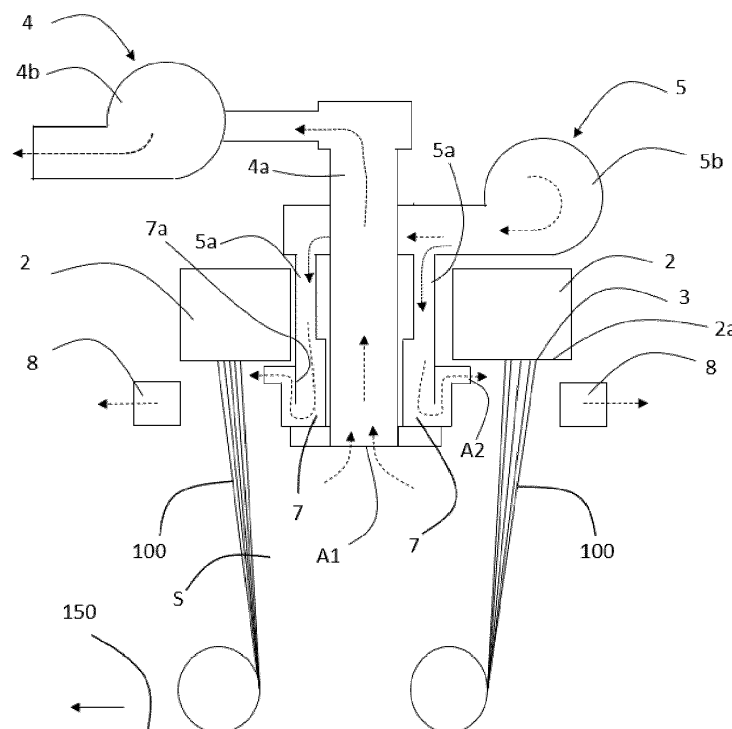
(72) Inventor: **FARE', Rosaldo**
21054 Fagnano Olona (VA) (IT)

(74) Representative: **Gislon, Gabriele et al**
Marietti, Gislon e Trupiano S.r.l.
Via Larga, 16
20122 Milano (IT)

(54) APPARATUS AND PROCESS FOR THE PRODUCTION OF FILAMENTS

(57) Apparatus for the production of filaments, comprising an annular spinning head adapted to extrude at least one plurality of filaments from polymers, comprising an extrusion surface equipped with a group of extrusion holes arranged in an annular configuration; at least one suction device comprising at least one suction port for suctioning heated gas; at least one cooling device to cool

said plurality of filaments by means of cooled gas, comprising at least one delivery port to deliver cooled gas. Said at least one suction port and the at least one delivery port are arranged within a space which is laterally delimited by the extrusion holes and by the plurality of filaments extruded from the annular spinning head.

**Fig. 1**

Description

FIELD OF INVENTION

[0001] The present invention relates to an apparatus and process for producing filaments by extrusion; more specifically, the invention relates to a process and device for producing filaments which are extruded from annular spinnerets.

[0002] These filaments can be further processed, according to known techniques, to produce staple fibers, that is, fibers whose lengths can vary according to their intended use. Known techniques for producing staple fibers may provide a step of drawing, texturing or crimping the filaments followed by cutting the filaments to lengths determined by their intended use.

[0003] A typical apparatus for the production of filaments by extrusion comprises a spinning head fed by extruders, cooling devices to cool the extruded filaments and at least one roller to collect the extruded filaments.

[0004] Of particular importance among the components of the apparatus are the cooling elements, which allow the filaments extruded in the spinneret to be at least partially cooled. In fact, one of the obstacles in the production of filaments is accumulation of hot air which is trapped by the extruded filaments and prolongs the cooling time of the same filaments.

STATE OF THE ART

[0005] As described, for example, in IT245831B in the name of the Applicant, the filaments can be cooled by air at room temperature and/or cooled air, which is caused to flow from the center of the spinneret head towards the ends of the spinneret head in a substantially radial direction and below the spinning head towards the extruded filaments.

[0006] As described, for example, in WO9829583, cooling of the extruded filaments below the spinning head can be achieved by means of cooling air injected from ducts located laterally, i.e. outside the extruded filaments, and below the spinneret head, so that the cooling air flow crosses the filament bundle from the outside to the inside.

[0007] Some of the cooling air is then conveyed to a duct centrally located in the spinneret.

[0008] Such systems allow the extruded filaments to be cooled, but it can take a long time to actually reduce the amount of hot air accumulated within the spinneret and cool the extruded filaments quickly.

[0009] The extrusion of filaments from the spinneret also produces oligomers or monomers or polymer degradation products within the spinneret, which can be harmful to operator health in high ambient air temperatures, inhibit filament cooling and alter the mechanical and chemical properties of the filaments after being extruded.

[0010] An object of the present invention is to solve the above-mentioned drawbacks by providing a process and

an apparatus for the production of filaments which can effectively remove hot air formed in the annular spinning head and remove oligomers or monomers or degradation products resulting from the extruded filaments within the annular spinning head thereby ensuring an increase in filament production, providing a healthy working environment for operators and ensuring low production costs.

[0011] Another object of the invention is to increase the production of filaments under the same production conditions (e.g., cooling gas temperature).

DESCRIPTION OF THE INVENTION

[0012] These and other objects are achieved by the present invention as discussed in one or more of the appended claims.

[0013] Specifically, an aspect of the present invention relates to an apparatus according to claim 1, and a different aspect concerns a related process according to claim 9. Preferred aspects are set forth in the dependent claims.

[0014] In more detail, an aspect of the present invention relates to an apparatus for producing filaments, comprising an annular spinning head adapted to extrude at least one plurality of filaments from polymers, comprising an extrusion surface equipped with a group of extrusion holes arranged in an annular configuration; at least one suction device comprising at least one suction port for suctioning heated gas; and at least one cooling device to cool said plurality of filaments by means of cooled gas, comprising at least one delivery port to deliver said cooled gas. The suction port and the delivery port are arranged within a space laterally delimited by said extrusion holes arranged in an annular configuration and by the plurality of filaments extruded from said annular spinning head.

[0015] It should be noted that the expression "annular configuration" of the extrusion holes on the extrusion surface of the annular spinning head is used herein and below to denote a configuration in which the extrusion holes are arranged within an annulus. An annulus can be typically identified by an inner circle and an outer circle in which the diameter of the inner circle is smaller than the diameter of the outer circle. Therefore, the annular configuration of the extrusion holes identifies the arrangement of the extrusion holes within the annulus.

[0016] In addition, it should be noted that the expression "annular configuration" of the extrusion holes on the extrusion surface of the annular spinning head, used herein and below, also refers to possible embodiments in which the holes are arranged along the perimeter of a circumference or along the perimeter of multiple circumferences.

[0017] It should be noted that the term "laterally delimited space" means the inner space defined by the arrangement of the extrusion holes on the extrusion surface of the annular spinning head and the projection of

that holes arrangement in a direction perpendicular to the extrusion surface in which the extrusion holes are arranged.

[0018] According to an embodiment, the plurality of filaments can be extruded in a direction perpendicular to the extrusion surface such that the laterally delimited space is substantially a cylindrical space.

[0019] According to an alternative embodiment, the plurality of filaments can be extruded in a direction which is not perpendicular to the extrusion surface such that the laterally delimited space has truncated cone shape.

[0020] Advantageously, by positioning the suction port and the delivery port within the laterally delimited space, the drawbacks complained of in the known prior art can be overcome.

[0021] Specifically, the delivery port of the cooling gas and the suction port in the space inside the filaments can cooperate with each other so that the suction device allows the heated gas present downstream of the extrusion surface of the annular spinning head to be removed.

[0022] The removal of heated gas downstream of the extrusion surface of the annular spinning head prevents alteration of the mechanical properties and chemical properties of the plurality of extruded filaments.

[0023] In addition, at the same time, the suction device allows the removal of heated gas that may comprise oligomers, monomers or polymer degradation products (hereafter referred to as "waste products"), which are generated either within the annular spinning head or downstream of the extrusion surface of the annular spinning head. The waste products may have a total mass that fluctuates in the heated gas, which altogether can cause thermal conduction, that is to say diffusive heat transport in the surroundings, which can inhibit the proper extrusion of filaments. Removing waste products in a high temperature environment prevents them from being deposited on the extruded filaments thereby altering the mechanical and chemical characteristics thereof or otherwise preventing an uneven distribution of filaments in terms of, for example, diameter or amorphous characteristics or mechanical stiffness or malleability of the filaments after being extruded.

[0024] Advantageously, the cooling device allows the cooling of the plurality of extruded filaments by means of cooled gas, thereby allowing the removal of high temperature gases present downstream of the extrusion surface of the annular spinning head and the cooling of the mass of waste products, if any, which at high temperatures can accumulate around the filaments and which, as mentioned above, can alter the mechanical and chemical characteristics of the extruded filaments. The cooled gas delivered through the delivery port is directed against the extruded filaments so as to decrease the temperature of the extruded filaments.

[0025] Advantageously, at least one suction port and at least one delivery port arranged within the laterally delimited space allow heated gas resulting from the extrusion of the filaments into the annular spinning head to be

suctioned and, at the same time, cooling gas can be delivered to decrease the temperature of the drawn filaments.

[0026] According to a possible aspect, the apparatus comprises at least one roller to collect said filaments to form filaments.

[0027] According to a possible aspect, the filaments are extruded at an angle α of between 2° and 40° , preferably between 5° and 20° , with respect to a plane perpendicular to the extrusion surface.

[0028] The plurality of filaments can be extruded at an angle α with respect to a plane perpendicular to the extrusion surface such that the laterally delimited space has truncated cone shape and such that at least one portion of the plurality of extruded filaments can converge towards one or more collection points on at least one roller to collect filaments in order to form filaments.

[0029] According to alternative embodiments, the plurality of filaments can be extruded at an angle α with respect to a plane perpendicular to the extrusion surface such that the laterally delimited space is a cylindrical space.

[0030] According to a possible aspect, the suction port is arranged at a distance of between 3 mm and 60 mm, preferably between 5 mm and 20 mm, from the extrusion surface in a direction perpendicular to the extrusion surface of the annular spinning head.

[0031] Advantageously, by adjusting the distance between the suction port and the extrusion surface, the region where heated gas can be suctioned below the annular spinning head can be adjusted. This is particularly advantageous depending on the type of polymers extruded into the annular spinning head to form the plurality of filaments.

[0032] According to a possible aspect, the delivery port is arranged at a distance of between 3 mm and 60 mm, preferably between 5 and 20 mm, from the extrusion surface in a direction perpendicular to said extrusion surface of the annular spinning head.

[0033] Advantageously, the delivery port can be arranged at such a distance that the region in which the extruded filaments are cooled below the extrusion surface of the annular spinning head can be adjusted. This is particularly advantageous depending on the type of polymers extruded into the annular spinning head.

[0034] According to a possible aspect, the suction port is fluidically connected to at least one suction duct and at least one aspirator.

[0035] According to a possible aspect, the delivery port is fluidically connected to at least one cooling duct and at least one blower.

[0036] The cooling gas can be cooled by means known in the art and then conveyed through the blower into the cooling duct to then flow out below the annular spinning head through at least one delivery port in order to cool the extruded filaments.

[0037] According to a possible aspect, the cooling duct comprises at least one accumulation chamber down-

stream of the blower and upstream of the at least one delivery port in order to accumulate cooled gas before delivering it through the at least one delivery port.

[0038] Advantageously, the accumulation chamber downstream of the blower and upstream of the delivery port allows a volume of cooled gas to be accumulated upstream of the delivery port in such a way as to ensure that a volume of cooling gas can be delivered through the delivery ports without causing high pressure drops and/or flow rate drops and such that the cooling gas is not affected by possible turbulent flows that might form in the cooling duct. In other words, the cooling gas can accumulate in the accumulation chamber so as to ensure a constant flow of cooling gas out of the delivery port(s).

[0039] Preferably, the accumulation chamber comprises one or more protrusions, walls or septum, which allow the cooling gas from the blower to be conveyed into a path that allows the forward speed of the cooling gas from the blower to be reduced and that ensures a laminar flow or at least a flow in which the turbulence determined by the forward speed of the gas from the blower is at least negligible.

[0040] According to a possible aspect, the apparatus for the production of filaments comprises at least one second suction element arranged outside the space laterally delimited by the extrusion holes arranged in an annular configuration and by the plurality of filaments extruded from the annular spinning head, in order to suction gas below the annular spinning head.

[0041] Advantageously, the second suction element ensures uniform cooling of the plurality of filaments. In other words, the second suction element ensures that cooling occurs uniformly in both the side surfaces of the filaments facing outside the laterally delimited space and in the filament surfaces facing inside the laterally delimited space. The second suction element ensures that the mechanical and chemical properties of the plurality of extruded filaments are not different inside and outside the laterally delimited space.

[0042] An aspect of the present invention further relates to a process for producing filaments by polymers, by means of an apparatus described above, comprising the steps of: i) extruding a plurality of filaments from a group of extrusion holes of an annular spinning head; ii) cooling said filaments below the annular spinning head by means of a cooling device to cool said plurality of filaments by means of cooling gas; iii) depositing said filaments on said at least one roller for compacting said filaments; wherein at least one portion of gas is removed by a suction device.

[0043] Advantageously, step ii) makes it possible to decrease the temperature of the extruded filaments by removing heated gas flowing through the extruded filaments and to remove or at least reduce the amount of waste substances produced during filament extrusion in the annular spinning head.

[0044] Advantageously, the plurality of cooled filaments allow filament production to be increased in the

range of 20% to 30% compared with apparatuses known in the technique under the same production conditions.

[0045] According to a possible aspect, in said step i) the filament bundle extruded from the annular spinning head has a temperature in a range between 180 °C and 320 °C, preferably in a range between 240 °C and 300 °C.

[0046] According to a possible aspect, at least in said step ii) the plurality of filaments are cooled to a temperature between 8 °C and 60 °C, preferably between 15 °C and 35 °C.

[0047] According to a possible aspect, the blower directs cooled gas into the cooling duct at a speed between 0.5 m/s and 10 m/s, preferably between 1 m/s and 5 m/s.

[0048] According to a possible aspect, the aspirator suctions gas at a speed between 0.5 m/s and 10 m/s, preferably between 1 m/s and 5 m/s.

[0049] According to a possible aspect, the polymers for the production of filaments can be polyolefins or polyesters or polyamides, or a combination of one or more of the above.

[0050] Polymers for the production of filaments belonging to the category of polyolefins can be polypropylene (PP), polyethylene (PE) and the like. Polymers for the production of filaments belonging to the category of polyesters can be polyethylene terephthalate (PET) and the like. Polymers for the production of filaments belonging to the category of polyamides, preferably aliphatic polyamides such as nylon (PA6) and the like.

BRIEF DESCRIPTION OF THE FIGURES

[0051] The invention will now be described in more detail with reference to the drawings included for illustrative and non-limiting purposes, where:

- figure 1 is a schematic view of a possible embodiment of an apparatus for the production of filaments according to the invention;
- figure 2 is a view of a portion of the apparatus in figure 1 in which there is a truncated cone space laterally delimited by the extruded filaments and the extrusion holes;
- figure 3 is a view of a portion of the apparatus in figure 1 according to an alternative embodiment, in which there is a cylindrical space laterally delimited by the extruded filaments and the extrusion holes;
- figure 4 is a perspective and schematic view of the plane P defined with respect to the central axis and the extrusion surface of the annular spinning head in figure 2 and figure 3.

DETAILED DESCRIPTION OF THE INVENTION

[0052] The apparatus 1 for the production of filaments 150 comprises an annular spinning head 2 adapted to extrude at least one plurality of filaments 100 from polymers, comprising an extrusion surface 2a equipped with a group of extrusion holes 3 arranged in an annular

configuration.

[0053] As mentioned above, the annular configuration of the extrusion holes 3 on the extrusion surface 2a of the annular spinning head 2 denotes a configuration in which the extrusion holes 3 can be arranged within an annulus. The annulus can be typically identified by an inner circle and an outer circle in which the diameter of the inner circle is smaller than the diameter of the outer circle. Therefore, the annular configuration of the extrusion holes 3 identifies the arrangement of the extrusion holes within the annulus.

[0054] According to an alternative embodiment, the annular configuration of the extrusion holes 3 on the extrusion surface 2a of the annular spinning head 2 reveals a configuration in which the holes can be arranged along the perimeter of a circumference or along the perimeter of several circumferences.

[0055] The apparatus further comprises a suction device 4 comprising at least one suction port A1 for suctioning heated gas.

[0056] The suction port A1 allows heated gas produced during extrusion of the filaments 100 in the annular spinning head 2, below the annular spinning head 2, to be removed, as shown for example in figure 1.

[0057] The apparatus further comprises a cooling device 5 to cool said plurality of filaments 100 by means of cooled gas, comprising a delivery port A2 to deliver said cooled gas.

[0058] The delivery port A2 of cooled gas allows cooled gas to be delivered below the annular spinning head 2 so that the extruded filaments 100 can be cooled.

[0059] The suction port A1 and the delivery port A2 are arranged within a space S laterally delimited by the extrusion holes 3 arranged in an annular configuration and by the plurality of filaments 100 extruded from said annular spinning head 2.

[0060] The space S laterally delimited by the extrusion holes 3 in an annular configuration and delimited by the plurality of filaments 100 extruded from the annular spinning head is the inner space defined by the arrangement of the extrusion holes 3 on the extrusion surface 2a of the annular spinning head 2 and the projection of that hole arrangement in a direction perpendicular to the extrusion surface 2a in which the extrusion holes 3 are arranged.

[0061] Advantageously, the arrangement of both the suction port A1 and the delivery port A2 within a space S laterally delimited by the extrusion holes 3 in an annular configuration and by the plurality of filaments 100 extruded from the annular spinning head 2 allows the suction device 4 comprising the suction port A1 and the cooling device 5 comprising the dispensing port A2 to cooperate with each other.

[0062] In other words, due to the positioning of the suction port A1 and the delivery port A2, which are arranged within a laterally delimited space S, it is possible to remove heated gas present downstream of the extrusion surface 2a of the annular spinning head 2 and to deliver cooled gas towards the plurality of filaments 100

extruded from the group of extrusion holes 3.

[0063] In the case where the extrusion holes 3 are arranged in an annular configuration within an annulus, the inner space defined by the arrangement of the extrusion holes on the extrusion surface 2a is defined by the extrusion holes.

[0064] In the case where the extrusion holes 3 are arranged in an annular configuration along the perimeter of multiple circumferences, the inner space defined by the arrangement of the extrusion holes on the extrusion surface 2a is defined by the extrusion holes arranged along the circumference having the largest diameter.

[0065] According to an embodiment, the plurality of filaments 100 can be extruded in a direction perpendicular to the extrusion surface 2a such that the space S is substantially a cylindrical space, as shown, for example, in figure 3.

[0066] According to an alternative embodiment, the plurality of filaments can be extruded in a direction which is not perpendicular to the extrusion surface such that the space S has truncated cone shape as shown, for example, in figure 2.

[0067] The filaments are extruded at an angle α of between 5° and 40° , preferably between 10° and 20° , with respect to a plane P perpendicular to the extrusion surface 2a.

[0068] The plane P perpendicular to the extrusion surface 2a is a plane passing through one of the extrusion holes 3 arranged in an annular configuration and passing through the central axis Z of the annular spinning head 2, as schematically shown, for example, in figure 4.

[0069] Preferably, the diameter of the annular spinning head 2 is between 300 mm and 1000 mm, preferably it is 700 mm.

[0070] The suction port A1 is arranged at a distance D1 of between 2 mm and 50 mm, preferably between 5 mm and 20 mm, from the extrusion surface 2a in a direction perpendicular to the extrusion surface 2a of the annular spinning head 2.

[0071] According to a possible aspect, the suction port A1 is fluidically connected to a suction duct 4a and to an aspirator 4b.

[0072] The suction duct 4a allows the heated gas suctioned from suction port A1 to be conveyed and removed.

[0073] According to an embodiment, the suction duct 4a extends through the annular spinning head 2.

[0074] Preferably, the central axis of the suction duct 4a is coincident with the central axis Z of the annular spinning head 2.

[0075] According to a possible aspect, the delivery port A2 is arranged at a distance D2 of between 5 mm and 25 mm from the extrusion surface 2a in a direction perpendicular to the extrusion surface 2a of the annular spinning head 2, preferably between 5 mm and 10 mm.

[0076] The distance D2 can be calculated along a direction perpendicular to the extrusion surface and measured as the distance between the extrusion surface 2e

and the center axis of the delivery port A2, as shown, for example, in figure 2 and figure 3.

[0077] According to a possible aspect, the delivery port A2 is fluidically connected to a cooling duct 5a and to a blower 5b.

[0078] The cooling duct 5a is located downstream of the blower 5b and upstream of the suction port A2 and allows cooled gas to be conveyed from the blower 5b to the delivery port A2.

[0079] Preferably, the cooling duct 5a comprises at least one accumulation chamber 7 downstream of the blower 5b and upstream of the delivery port A2 in order to accumulate cooled gas before delivering it through the at least one delivery port A2.

[0080] Advantageously, the accumulation chamber 7 allows a volume of cooled gas to be accumulated upstream of the delivery port A2, thereby allowing the delivery of a volume of cooling gas through the delivery ports A2 without pressure drops and/or flow rate drops and such that it is not affected by possible turbulent flows that might form in cooling duct 7 that receives cooling gas from the blower 5b. In other words, the cooling gas can accumulate in the accumulation chamber 7 so as to ensure a constant flow of cooling gas out of the delivery ports A2.

[0081] Preferably, the accumulation chamber 7 comprises one protrusion, or wall, or septum, 7a which allows the cooling gas from the blower to be conveyed into a path that allows the forward speed of the cooling gas from the blower to be adjusted and that ensures a laminar flow or at least a constant flow in which the turbulence determined by the forward speed of the gas in the cooling duct 5a is at least negligible.

[0082] According to a possible aspect, the apparatus 1 comprises at least one second suction element 8 arranged outside the space S in order to suction gas below to the annular spinning head 2.

[0083] The second suction element 8 allows gas to be suctioned outside the space S so as to ensure that the cooling gas can uniformly cool the filaments and so that additional suction can be provided for the heated gas that is produced by the extrusion of the filaments 100 below the annular spinning head 2.

[0084] According to a possible aspect, the apparatus further comprises at least one roller 6 to collect filaments.

[0085] By rotating said at least one roller 6, the filaments 100 can be compacted and further processed according to known techniques, in order to form staple fibers.

[0086] A further aspect of the invention comprises a process for producing filaments 150 by using polymers by means of the above-described apparatus 1, comprising the steps of: i) extruding a plurality of filaments 100 from a group of extrusion holes 3 of an annular spinning head 2; ii) cooling the plurality of filaments 100 below the annular spinning head 2 by means of a cooling device 5 to cool the plurality of filaments 100 by means of cooling gas; iii) depositing said plurality of filaments 100 on at

least one roller 6 for compacting said plurality of filaments 100 to form filaments 150. The process further comprises removing at least one portion of heated gas by means of a suction device 5.

[0087] Preferably, in said step i) the plurality of filaments extruded from the annular spinning head 2 has a temperature in a range between 180°C and 320 °C, preferably in a range between 200 °C and 300 °C.

[0088] Preferably, the polymers for the production of filament 150 can be olefin polymers or polyesters or other polyamides.

[0089] Polymers for the production of filaments 150 belonging to the category of polyolefins can be polypropylene PP, polyethylene PE and the like. Polymers for the production of filaments 150 belonging to the category of polyesters can be polyethylene terephthalate PET and the like. Polymers for the production of staple fibers belonging to the category of polyamides can be nylon (PA6) and the like.

[0090] According to a possible aspect, at least in said step ii) the plurality of filaments 100 are cooled to a temperature between 8 °C and 50 °C, preferably between 15 °C and 35 °C.

[0091] During step ii) heated gas can be removed along with waste products, if any, caused by filament extrusion in the annular spinning head, such that the temperature of the heated gas present below the extrusion surface of the spinning head can be decreased and, as a result, the rapid cooling of the filaments can be facilitated and such that the production of staple fibers can be increased by 20% to 30% compared with processes known in the art, under the same production conditions.

[0092] The blower 5b directs cooled gas into the cooling duct 5a at a speed between 3 m/s and 10 m/s, preferably between 5 m/s and 7 m/s.

[0093] The aspirator 4b suction gas at a speed between 3 m/s and 10 m/s, preferably between 5 m/s and 7 m/s.

Claims

1. Apparatus (1) for the production of filaments (150), comprising:

- a. an annular spinning head (2) adapted to extrude at least one plurality of filaments (100) from polymers, comprising an extrusion surface (2a) equipped with a group of extrusion holes (3) arranged in an annular configuration;
- b. at least one suction device (4) comprising at least one suction port (A1) for suctioning heated gas;
- c. at least one cooling device (5) to cool said plurality of filaments (100) by means of gas, comprising at least one delivery port (A2) to deliver said gas;

wherein said at least one suction port (A1) and said at least one delivery port (A2) are arranged within a space (S) which is laterally delimited by said extrusion holes (3) arranged in an annular configuration and by the plurality of filaments (100) extruded from said annular spinning head (2).

2. Apparatus according to claim 1, wherein the filaments are extruded at an angle α of between 2° and 40°, preferably between 5° and 20°, with respect to a plane (P) perpendicular to the extrusion surface (2a).

3. Apparatus according to claim 1 or 2, wherein the suction port (A1) is arranged at a distance (D1) of between 3 mm and 60 mm, preferably between 5 mm and 20 mm, from the extrusion surface (2a) in a direction perpendicular to said extrusion surface (2a) of the annular spinning head (2).

4. Apparatus according to one of the preceding claims, wherein the delivery port (A2) is arranged at a distance (D2) of between 3 mm and 60 mm, preferably between 5 mm and 20 mm, from the extrusion surface (2a) in a direction perpendicular to the extrusion surface (2a) of the annular spinning head (2).

5. Apparatus according to one of the preceding claims, wherein said at least one suction port (A1) is fluidically connected to at least one suction duct (4a) and to at least one aspirator (4b).

6. Apparatus according to one of the preceding claims, wherein said at least one delivery port (A2) is fluidically connected to at least one cooling duct (5a) and to at least one blower (5b).

7. Apparatus according to claim 6, wherein the cooling duct (5a) comprises at least one accumulation chamber (7) downstream of the blower (5b) and upstream of the at least one delivery port (A2) in order to accumulate cooled gas before delivering it through the at least one delivery port (A2).

8. Apparatus according to one of the preceding claims, comprising at least one second suction element (8) arranged outside the space (S) which is laterally delimited by said extrusion holes (3) arranged in an annular configuration and by the plurality of filaments (100) extruded from said annular spinning head (2).

9. Process for the production of filaments (150) by polymers, by means of an apparatus (1) according to one or more of the preceding claims, comprising the steps of:

i. extruding a plurality of filaments (100) from a

group of extrusion holes (3) of an annular spinning head (2);

ii. cooling said plurality of filaments (100) below the annular spinning head (2) by means of a cooling device (5) to cool said plurality of filaments (100) by cooling gas;

iii. depositing said plurality of filaments (100) on at least one roller (6) to compact said plurality of filaments to form filaments (150);

wherein at least one portion of gas is removed by said at least one suction device (5).

10. Process according to claim 9, wherein in said step i) said plurality of filaments extruded from the annular spinning head (2) has a temperature in a range between 180°C and 320 °C, preferably in a range between 240 °C and 300 °C.

11. Process according to one of the preceding claims, wherein at least in said step ii) said plurality of filaments are cooled to a temperature between 8 °C and 60 °C, preferably between 15 °C and 35 °C.

12. Process according to one of the preceding claims, wherein a blower (5b) directs cooled gas into the cooling duct (5a) at a speed between 0.5 m/s and 10 m/s, preferably between 1 m/s and 5 m/s.

14. Process according to one of the preceding claims, wherein the aspirator (4b) suctions gas at a speed between 0.5 m/s and 10 m/s, preferably between 1 m/s and 5 m/s.

15. Process according to one of the preceding claims, wherein the polymers for the production of filaments are selected from olefin polymers or polyesters or other polyamides, or a combination of one or more of the above.

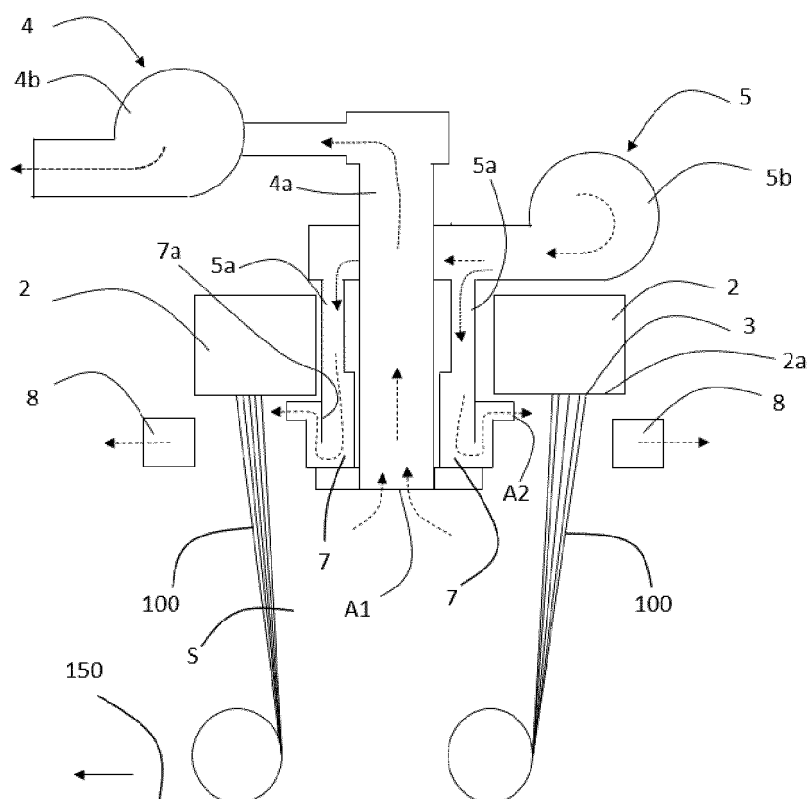


Fig. 1

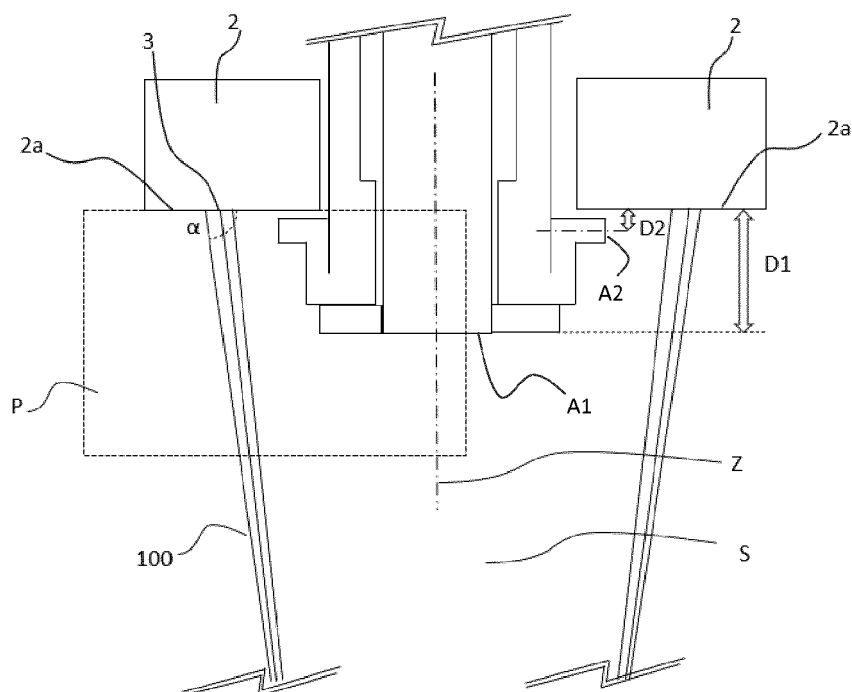


Fig. 2

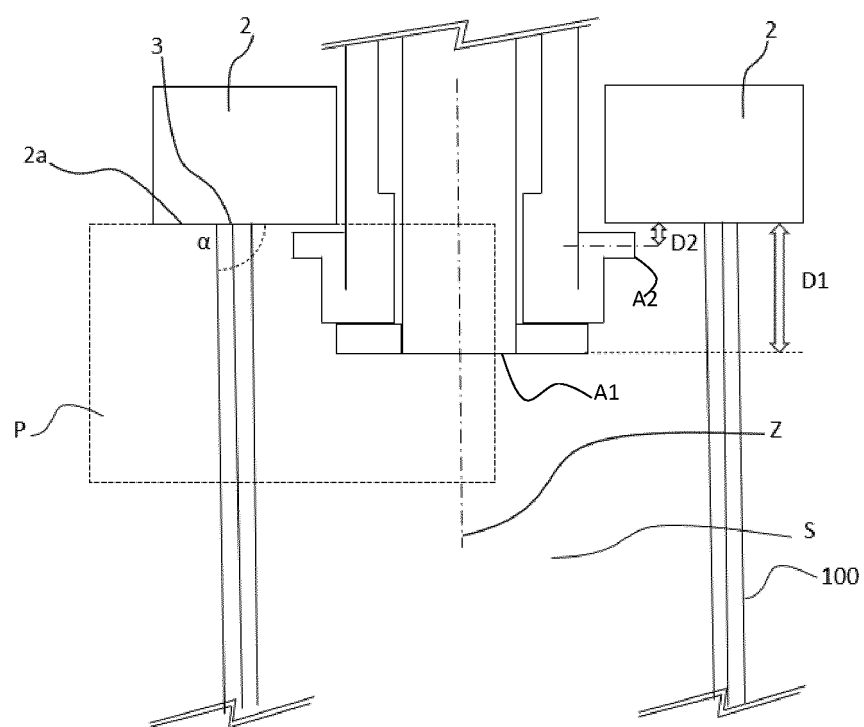


Fig. 3

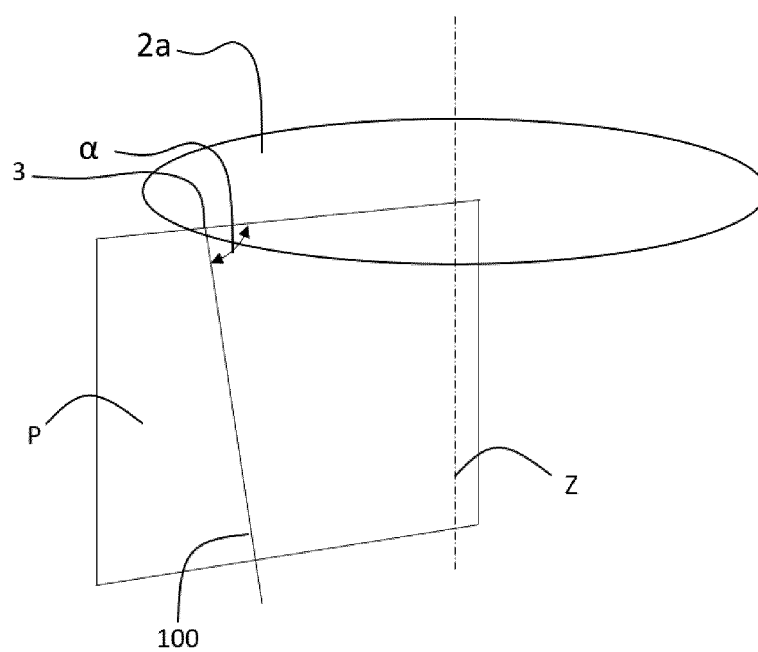


Fig. 4



EUROPEAN SEARCH REPORT

Application Number

EP 23 19 7971

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	JP 2000 345424 A (TEIJIN SEIKI CO LTD) 12 December 2000 (2000-12-12) * figures 1-3 * * paragraphs [0013], [0014], [0020], [0021], [0025] *	1-15	INV. D01D5/088
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