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(54) **PLANT FOR PRODUCING NON-WOVEN FABRIC**

(57) Plant for producing non-woven fabric, comprising a support structure (2) provided with a main channel (3) extended along a vertical axis (Y), a cooling station (8), which comprises a containment body (11) which is extended around the vertical axis (Y) delimiting a cooling chamber (12) within the main channel (3), cooling means in fluid connection with the cooling chamber (12) and adapted to introduce, into the cooling chamber (12), a first air flow (10) for cooling the filaments (7) susceptible of crossing the cooling chamber (12), and the containment body (11) comprises at least one movable portion (14) on the support structure (2); the plant also comprises actuator means (13) arranged for moving the movable portion (14) between a closed configuration, in which the containment body (11) perimetrically closes the cooling chamber (12) at least around the vertical axis (Y), and an open configuration, in which the at least one movable portion (14) defines at least one access opening (22) which connects the cooling chamber (12) to an outside environment.

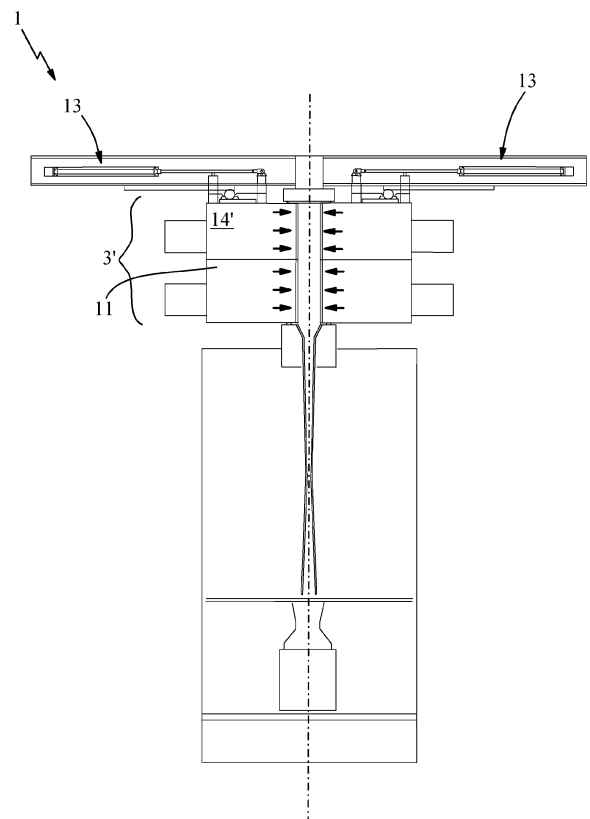


Fig. 1

Description

Field of application

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

[0002] The present plant for producing non-woven fabric is intended to be advantageously employed in the field of production of fiber webs adapted to form a non-woven fabric, normally web-like. Such webs are normally used for producing sanitary products, such as caps, masks and gloves or in the field of agriculture for producing non-woven fabric intended to be set on the ground to be cultivated, in order to prevent the formation of weeds and/or for protecting seeds.

[0003] More particularly, the plant for producing non-woven fabric, object of the present invention, is advantageously employable for producing a continuous web of semifinished non-woven fabric, intended to sustain subsequent transformations in order to obtain a finished product.

[0004] The invention is therefore inserted in the context of the industrial field of production of non-woven fiber web-like material, or more generally in the field of production of non-woven fabric.

State of the art

[0005] For some time in the field of production of plastic material fiber webs, it has been known to produce non-woven fabric, such as polypropylene spunbond, polyester spunbond and/or other polymer spunbond, in particular for producing bandages, gauzes, caps, masks and other sanitary product, or for example for producing non-woven fabric intended to be used in the farming field for covering terrain to be cultivated.

[0006] More generally, the non-woven fabric is a semifinished product intended to undergo successive processing steps in order to produce products of various nature, normally made of plastic material and with web shape or with superimposed webs. Such webs are formed by filaments randomly placed in layers and only joined mechanically, or by means of adhesives, or at least partially melted together by means of heat.

[0007] In the aforesaid technical field of production of non-woven fabric, plants for producing non-woven fabric have been known for some time which normally provide for the formation of a plurality of plastic material filaments, which are stretched, set on a conveyor belt and then pressed on each other in a random manner, in order to form aforesaid webs of non-woven fabric.

[0008] One example of a plant for producing non-woven fabric is described in the document US 8,992,810. The plant described herein is vertically extended along a main channel, along which various operating stations are vertically provided for in succession for the production

of the aforesaid filaments of plastic material.

[0009] On the upper part, a station is provided for extruding a plurality of plastic material filaments at high temperature, which are introduced within the main channel through an upper inlet mouth, at which an extrusion head is placed from which the filaments exit outward. As is known, 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 outward in filament form.

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

[0011] On the lower part, a station for cooling (normally known as "quenching" in the technical jargon of the field) is provided, 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 being formed at the outlet of the extrusion head of the extrusion station.

[0013] The cooling station comprises lateral walls, normally metallic, which define a cooling volume within which the high-temperature filaments start to cool.

[0014] In order to stretch the filaments obtained by the extrusion station and subsequently cooled by the cooling station, the plant normally provides for an adjustment station, in which the air introduced into the first introduction section elongates the plastic material filaments within a reduced section part of the main channel, up to making them reach the desired size, i.e. until they reach a linear density of about 1 - 5 dtex.

[0015] In order to obtain the desired weave (i.e. a substantially random and uniform arrangement of the filaments) for the production of the non-woven fabric, it is necessary to randomly weave the filaments together, forming a dense weave substantially without interruption.

[0016] For such purpose, the plant of known type is provided with a deposition station at a terminal section of the main channel, which on the lower part terminates with an outlet opening opposite the inlet opening.

[0017] More in detail, the air that flows within the terminal section of the main channel is moved in a manner such to confer a turbulent motion thereto. In this manner, the filaments are thrust by the air and are woven together in a substantially random manner in order to form the aforesaid desired weave of the non-woven fabric.

[0018] The terminal section of the main channel is extended downward, and in particular towards the outlet opening, it comprises a diffuser with substantially frusto-conical shape. The air that flows at its interior therefore encounters an increase of the duct section and slows, taking on a turbulent motion, mixing and weaving the filaments that slide within the terminal section itself.

[0019] The plant of known type provides for, below the deposition section, a conveyor belt placed below the outlet opening with which the terminal section of the main channel terminates in order to receive the filaments.

[0020] The conveyor belt is moved in order to advance the filaments set thereon along a substantially horizontal movement direction, in order to form the web of non-woven fabric.

[0021] Subsequently, the web of non-woven fabric thus obtained further undergoes processing steps such as a pressing and is then moved towards a winding station in which the web is wound around a support core in order to form reels of non-woven fabric, allowing a quick storage and transportation thereof.

[0022] Further examples of plants for producing non-woven fabric are described in the documents US 2007/090555 and US 2018/282925.

[0023] The plant for producing non-woven fabric of known type briefly described up to now has in practice shown that it does not lack drawbacks.

[0024] The main drawback lies in the fact that the maintenance and cleaning operations, in particular of the cooling station, require the use of a plurality of technicians who dismount the lateral walls of the cooling station itself, in order to remove discards of plastic material introduced by the extrusion station together with the filaments.

[0025] The maintenance operations are in fact quite frequent, since the undesired deposit of plastic material coming from the extrusion station that is accumulated, for example along the walls which define the cooling volume, risks being separated and falling along the main channel, blocking the passage of the filaments or in any case negatively affecting the quality of the final non-woven fabric.

[0026] A further drawback of the plants of known type lies in the fact that the aforesaid maintenance operations are very slow, since the technicians must dismount the lateral walls of the cooling station in order to access the cooling volume and then proceed with the cleaning of the duct.

[0027] In addition, once the maintenance operation has terminated, it is necessary that the same technicians remount the lateral walls of the cooling station and they must be certain that the same station is completely sealed with respect to the outside environment.

[0028] Also known from document US 3169271 is a cooling station of a plant for producing plastic filaments provided with at least one small door hinged to a support structure. Such small door is positionable in an open configuration, in which it frees a passage for the insertion within a cooling chamber of at least one cleaning tool. However, also the latter cooling station has in practice shown that it does not lack all the aforesaid drawbacks of the abovementioned prior art.

Presentation of the invention

[0029] In this situation, the problem underlying the present invention is therefore that of overcoming the drawbacks manifested by the plants for producing non-woven fabric of known type, by providing a plant for producing non-woven fabric which allows carrying out the

maintenance operations in a quick manner.

[0030] A further object of the present invention is that of providing a plant for producing non-woven fabric which reduces the cost and the number of technicians necessary for executing the maintenance and cleaning operations.

[0031] A further object of the present invention is to provide a plant for producing non-woven fabric which allows an airtight closure of the cooling station following the cleaning and maintenance operations which is quick and simple.

[0032] A further object of the present invention is to provide a plant for producing non-woven fabric which is simple for operators to use.

[0033] A further object of the plant for producing non-woven fabric, object of the present invention, is that of providing a plant for producing non-woven fabric which is entirely safe and reliable in use.

Brief description of the drawings

[0034] The technical characteristics of the invention, according to the aforesaid objects, are clearly seen in the contents of the below-reported claims and the advantages thereof will be more evident from 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:

- Fig. 1 shows a schematic front view of a plant for producing non-woven fabric, object of the present invention, with a cooling station in a closed configuration;
- Fig. 2 shows a schematic front view of a detail of the plant for producing non-woven fabric illustrated in figure 1, regarding the cooling station in the closed configuration;
- Fig. 3 shows a schematic front view of the plant for producing non-woven fabric, object of the present invention, with the cooling station in an open configuration;
- Fig. 4 shows a schematic front view of a detail of the plant for producing non-woven fabric illustrated in figure 1, regarding the cooling station in the open configuration.

Detailed description of a preferred embodiment

[0035] With reference to the enclosed drawings, reference number 1 overall indicates a plant for producing non-woven fabric, according to the present invention.

[0036] This is intended to be employed for producing non-woven 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).

[0037] Hereinbelow reference will be made to a plant

1 for producing non-woven fabric in plastic material, in accordance with the preferred embodiment illustrated in the enclosed figures. Nevertheless, the plant 1 of the present invention can be advantageously employed also for producing non-woven fabric of another kind, per se known to the man skilled in the art and hence not described in detail hereinbelow.

[0038] Therefore, hereinbelow with the term "non-woven 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.

[0039] In particular, the non-woven fabric is normally composed of a plurality of plastic material filaments joined together by means of a mechanical action, e.g. by means of crushing.

[0040] The plant for producing non-woven fabric according to the invention comprises a support structure 2 provided with a main channel 3, which is extended along a vertical axis Y from an upper inlet mouth 4 to a lower outlet mouth 5.

[0041] Advantageously, the support structure 2 is intended to be set on the ground and preferably it is made of resistant metal material, such as steel and in particular stainless steel (non-oxidizable), such as AISI 304 steel or AISI 431 steel.

[0042] More in detail, the main channel 3 is extended vertically along the aforesaid vertical axis Y.

[0043] Hereinbelow it must be intended that the main channel 3 can be delimited by a substantially tubular body defined, in accordance with the preferred embodiment illustrated in the enclosed figures, by a plurality of substantially tubular sections that are vertically aligned with each other along the vertical axis Y and susceptible of being crossed by filaments 7 (as described in detail hereinbelow) for the treatment thereof.

[0044] The plant 1 comprises a feeding station 6 placed above the main channel 3 and in communication with the inlet mouth 4 in order to introduce filaments 7 in the main channel 3 for forming a non-woven fabric.

[0045] Preferably, the feeding station 6 comprises means for forming melted plastic material placed in flow connection with the inlet mouth 4 of the main channel 3 and comprising an extruder (per se known to the man skilled in the art and hence not described in detail hereinbelow), preferably supported by the support structure 2, adapted for form a continuous flow of melted plastic material and an extrusion head 29 mechanically supported by the support structure 2, placed in fluid connection with the extruder and provided with an extrusion plate facing towards the inlet mouth 4 of the main channel 3.

[0046] The extrusion plate of the extrusion head 29 of the feeding station 6 is advantageously provided with a plurality of through holes, susceptible of being crossed by the flow of melted plastic material in order to form the filaments 7.

[0047] In operation, the filaments 7 thus formed pass through the inlet mouth 4 and enter into the main channel 3 in order to allow a processing thereof through a plurality

of operating stations, as described in detail hereinbelow.

[0048] Advantageously, the plant 1, object of the present invention, comprises a fumes expulsion station provided below the feeding station 6, in order to expel from the main channel 3 possible fumes produced during the extrusion of the plastic material from the extrusion head 29 through a stack (not illustrated), which connects the main channel 3 of the plant 1 with the outside environment.

[0049] More in detail, the fumes expulsion station comprises at least one expulsion duct placed to intercept the main channel 3, in particular placed in fluid communication with the extrusion plate of the extrusion head 29, in order to convey the fumes produced by the latter towards the aforesaid stack.

[0050] The expulsion duct is adapted to convey the fumes and the vapors produced by the melted plastic material, extruded into the filaments 7 by the extrusion head, which could adhere to the internal walls of the main channel 3, forming crusts.

[0051] Preferably, the fumes expulsion station also comprises a heat exchanger of water-air type for cooling the fumes and the vapors coming from the extrusion head 29 of the feeding station 6 and for collecting a possible condensation fluid formed following such cooling.

[0052] According to the invention, the plant 1 comprises a cooling station 8, which is placed along the aforesaid main channel 3 below the feeding station 6.

[0053] The cooling station 8 comprises a containment body 11 extended along the vertical axis Y between an upper end 19 and a lower end 20, and is extended around the vertical axis Y, delimiting a cooling chamber 12 within the main channel 3.

[0054] In accordance with the preferred embodiment illustrated in the enclosed figures, the cooling chamber 12 preferably corresponds to a first section 3' of the main channel 3. The cooling station 8 also comprises cooling means in fluid connection with the cooling chamber 12, adapted to introduce, in the cooling chamber 12, a first air flow 10 for cooling the filaments 7 susceptible of crossing the cooling chamber 12.

[0055] Preferably, the cooling station 8 is provided with at least one first inlet opening 9 which places the cooling chamber 12 in fluid connection with the cooling means.

[0056] In accordance with the preferred embodiment illustrated in the enclosed figures, the first inlet opening 9 is provided at an internal wall 21 of the containment body 11 which delimits the main channel 3 and in particular at least partially defines the cooling chamber 12.

[0057] More in detail, the first inlet opening 9 is advantageously attained by means of a plurality of through holes made on the internal wall 21, at the first section 3' of the main channel 3.

[0058] Otherwise, in accordance with a further embodiment of the plant 1 not illustrated in the enclosed figures, the internal wall 21 of the containment body 11 can be attained by means of a grill, or a cell-like wall, whose substantially checkerboard-like openings define the

aforesaid first inlet opening 9.

[0059] Advantageously, the cooling station 8 comprises ventilation means (not illustrated) placed in fluid connection with the first inlet opening 9 in order to introduce, within the cooling chamber 12, the first air flow 10.

[0060] Preferably, the ventilation means comprise a rotary fan, of the type per se known to the man skilled in the art and hence not described in detail hereinbelow.

[0061] Such fan is configured for generating the first air flow 10 and introducing it within the cooling chamber 12 through the first inlet opening 9.

[0062] In addition, the ventilation means preferably comprise a heat exchanger interposed between the fan and the first inlet opening 9.

[0063] More in detail, the heat exchanger is placed to intercept the first air flow 10 generated by the fan and it is adapted to vary the temperature and the humidity of the first air flow 10 itself.

[0064] In accordance with a preferred embodiment of the present invention, the heat exchanger is an exchanger of water-air type, in particular an exchanger of water-air type with tube bundle.

[0065] Preferably, the heat exchanger is adapted to bring the first air flow 10 to a constant temperature comprised between 20°C and 30°C and in particular comprised between 22°C and 25°C.

[0066] Preferably, the exchanger is mechanically supported by the support structure 2 of the plant 1 in raised position and substantially aligned with the first inlet opening 9 of the containment body 11.

[0067] According to the idea underlying the present invention, the containment body 11 comprises at least one movable portion 14, arranged in a movable manner on the support structure 2.

[0068] The plant 1 also comprises actuator means 13 mechanically connected to the movable portion 14 and arranged for moving such movable portion 14 between a closed configuration, in which the containment body 11 perimetrically closes the cooling chamber 12 at least around the vertical axis Y, and an open configuration, in which the movable portion 14 defines at least one access opening 22 which connects the cooling chamber 12 to an outside environment.

[0069] Preferably, the actuator means 13 are of automatic type, in particular are configured for moving the movable portion 14 in an automated manner, without requiring the intervention of operators.

[0070] More in detail, the plant 1 comprises an electronic control unit electrically connected to the actuator means 13 and configured for actuating them to move the movable portion 14 of the containment body 11.

[0071] Preferably, the plant 1 also comprises a control panel, electrically connected to the electronic control unit and actuable by an operator in order to drive the electronic control unit so as to move the movable portion 14 of the containment body 11.

[0072] In operation, the control panel connected to the electronic control unit allows the operator to drive the

actuator means 13 in an automated manner without having to manually intervene at the cooling chamber 12.

[0073] In this manner, the plant 1, object of the present invention, allows opening the access opening 22 for the access of at least one operator in a quick and simple manner, so as to carry out the maintenance and/or cleaning operations of the cooling chamber 12.

[0074] More in detail, the containment body 11 is provided with at least one openable side 24, which is extended between the upper end 19 and the lower end 20 and on which the access opening 22 is defined with the movable portion 14 in closed configuration.

[0075] Advantageously, the actuator means 13 comprise at least one pneumatic actuator 30 mechanically associated with the movable portion 14 of the containment body 11.

[0076] In accordance with the preferred embodiment illustrated in the enclosed figures, the plant 1, object of the present invention, comprises guide means 23 extended along a horizontal direction X substantially transverse to the vertical axis Y and slidably carrying, mounted thereon, the movable portion 14 of the containment body 11.

[0077] In particular, the actuator means 13 are arranged for moving the movable portions 14 of the containment body along the horizontal direction X of the guide means 23 so as to move the movable portions 14 between the closed configuration and the open configuration.

[0078] Preferably, the pneumatic actuator 30 of the actuator means 13 is placed parallel to the horizontal direction X and configured for moving the movable portion 14 of the containment body 11 along the aforesaid horizontal direction X.

[0079] More in detail, the pneumatic actuator 30 of the actuator means 13 is extended between a first end 32 mechanically constrained to the support structure 2 of the plant 1 and a second end 33 mechanically constrained to the movable portion 14 of the containment body 11.

[0080] In order to move the movable portion 14 into the open configuration, the pneumatic actuator 30 is configured for being extended in an extended configuration in which the first end 32 constrained to the support structure 2 is moved away from the second end 33 constrained to the movable portion 14.

[0081] Analogously, in order to move the movable portion 14 into the closed configuration, the pneumatic actuator 30 is configured for being withdrawn into a retracted configuration in which the first end 32 constrained to the support structure 2 is brought close to the second end 33 constrained to the movable portion 14.

[0082] Preferably, the movable portion 14 of the containment body 11 is movable along the horizontal direction X away from and close to the vertical axis Y of the main channel 3.

[0083] Advantageously, the guide means 23 comprise at least one pinion 15 rotatably constrained to the movable portion 14 of the containment body 11 and at least

one rack 16 mechanically constrained to the support structure 2, engaged in a shape relationship with the pinion 15 and extended parallel to the horizontal direction X.

[0084] Preferably, the pinion 15 is rotatably mounted on a bracket 31 fixed to the movable portion 14 of the containment body 11 and it is susceptible of rotating around a substantially horizontal rotation axis thereof, substantially transverse to the horizontal direction X.

[0085] Advantageously, the bracket 31 is mounted above the movable portion 14 of the containment body 11.

[0086] In accordance with the embodiment according to the invention illustrated in the enclosed figures, the containment body 11 of the cooling station 8 comprises two movable portions 14, each movable between a closed configuration, in which they together define the cooling chamber 12 and an open configuration, in which together free the access opening 22.

[0087] With particular reference to the preferred embodiment illustrated in the enclosed figures, the two movable portions 14 are movable in a mirrored manner with respect to each other.

[0088] Advantageously, the actuator means 13 are of linear type, mounted parallel to the horizontal direction X in order to move the movable portions 14 along the horizontal direction X.

[0089] More in detail, the actuator means can be of any type suitable to move the movable portions 14, e.g. of pneumatic type or hydraulic type.

[0090] Advantageously, the plant 1 comprises motor means (not illustrated in the enclosed figures and per se well-known to the man skilled in the art) mechanically mounted on the support structure 2 and operatively connected to the actuator means 13 in order to actuate the latter to move the movable portions 14 of the containment body 11 in an automated manner.

[0091] Preferably, the motor means comprise at least one electric motor mechanically connected to the actuator means 13.

[0092] For example, the motor means comprise at least one compressor placed in fluid connection with a pneumatic piston of the actuator means 13 and provided with an electric motor mechanically actuatable in order to activate the compressor and drive the movement of the pneumatic piston.

[0093] Advantageously, the arrangement according to the invention of the actuator means 13 and of the guide means 23 for moving the movable portions 14 which define, in closed configuration, the cooling chamber 12, allows obtaining a wide opening of the latter in a simple and quick manner. Indeed, it is possible to move apart the two movable portions 14 which form the containment body 11 (which have considerable weight and bulk) by means of the simple actuation of the actuator means 13. Such movement of the movable portions 14 substantially involves the spreading apart of the containment body 11, defining a large size of the access opening 22 and a wide space between the two movable portions 14, allowing an

operator to easily move himself/herself in order to execute the maintenance operations (e.g. cleaning).

[0094] Advantageously, the actuator means 13 comprise at least two pneumatic actuators 30, each mechanically associated with a corresponding movable portion 14 of the two movable portions 14 of the containment body 11.

[0095] Preferably, the two pneumatic actuators 30 are extended along a horizontal direction substantially parallel to the horizontal direction X for moving the movable portions 14.

[0096] In addition, the guide means 23 of the plant 1 according to the invention preferably are extended along the aforesaid horizontal direction X substantially transverse to the vertical axis Y and slidably carry, mounted thereon, both the movable portions 14 of the containment body 11.

[0097] In accordance with the preferred embodiment illustrated in the enclosed figures, the guide means 23 comprise at least two pinions 15, each rotatably constrained to a corresponding movable portion 14 of the two movable portions 14 of the containment body 11 and at least two racks 16 mechanically constrained to the support structure 2, each engaged in a shape relationship with a corresponding pinion 15 of the at least two pinions 15, and are extended parallel to the horizontal direction X.

[0098] Advantageously, each movable portion 14 of the containment body 11 comprises a lateral portion 14', preferably with substantially box-like shape, vertically extended between the upper end 19 and the lower end 20.

[0099] In accordance with the preferred embodiment illustrated in the enclosed figures, each movable portion 14 is provided with an intermediate wall 36, preferably substantially horizontal, which divides the movable portion 14 into an upper manifold 34 and a lower manifold 35.

[0100] More in detail, the upper manifold 34 is extended vertically between the upper end 19 and the intermediate wall 36 and the lower manifold is extended between the intermediate wall 36 and the lower end 20.

[0101] The upper manifold 34 of the movable portion 14 of the containment body 11 is advantageously placed in fluid connection on one side with the ventilation means and on the other side with the cooling chamber 12 through the first inlet opening 9 and is intended to be crossed by the first air flow.

[0102] The lower manifold 35 of the movable portion 14 of the containment body 11 is advantageously placed in fluid connection on one side with the ventilation means and on the other side with the cooling chamber 12 through a second inlet opening 43 and is intended to be crossed by a second air flow 38.

[0103] More in detail, the lower manifold 35 of the movable portion 14 of the containment body 11 is provided with a second inlet opening 43 which places the cooling chamber 12 in fluid communication with the ventilation means, and susceptible of being crossed by the second air flow 38.

[0104] The movable portion 14 of the containment

body 11 preferably comprises at least one door 39 which projectingly protrudes from a perimeter edge of the internal wall 21 of the containment body 11, in order to close the cooling chamber 12 with the movable portion 14 in the closed configuration.

[0105] More in detail, the door 39 is extended vertically between the upper end 19 and the lower end 20 and defines the cooling chamber 12 together with the internal wall 21 of the containment body 11.

[0106] The internal wall 21 of each movable portion 14 is extended advantageously along a plane substantially orthogonal to the horizontal direction X.

[0107] Advantageously, the openable side 24 of the containment body 11 is defined by an external edge of the door 39.

[0108] Advantageously, each movable portion 14 comprises an aforesaid internal wall 21 (directed towards the internal wall 21 of the other movable portion 14) and preferably two doors 39 placed on opposite sides of the movable portion 14 and each adapted to close the cooling chamber 12, interacting with the corresponding door of the other movable portion.

[0109] In order to tightly seal the cooling chamber 12 of the cooling station 8, the plant 1, object of the present invention, preferably comprises sealing means 17 operatively associated with the at least one movable portion 14 and configured for tightly sealing the cooling chamber 12 with respect to the outside environment with the at least one movable portion 14 in the closed configuration.

[0110] Advantageously, the sealing means 17 comprise at least one inflatable seal 40, 41.

[0111] With the term "inflatable seal", it must be intended hereinbelow any type of seal which internally defines an expansion chamber configured for housing a pressurized fluid at its interior.

[0112] In this manner, the inflatable seal 40, 41 is movable between an expanded configuration, in which the pressurized fluid housed in the expansion chamber increases the volume occupied by the inflatable seal 40, 41 itself, and a retracted configuration, in which the expansion chamber substantially does not house fluid, decreasing the volume occupied by the inflatable seal 40, 41 itself.

[0113] The sealing means 17 of the plant 1, object of the present invention, preferably comprises a pressurized fluid circuit, placed in fluid connection with the inflatable seal.

[0114] For example, the circuit can be of pneumatic type, in which it is provided to feed pressurized air within the expansion chamber of the inflatable seal.

[0115] Otherwise, the circuit can be of oil-pressure type, in which it is provided to feed oil under pressure within the expansion chamber of the inflatable seal.

[0116] The pressurized fluid circuit can be driven in order to introduce the fluid within the expansion chamber of the inflatable seal, so as to move the seal itself from the retracted configuration to the expanded configuration.

[0117] Advantageously, the movable portion 14 is provided with an upper edge 25 at its upper end 19 which at least partially delimits the inlet mouth 4, with the movable portion 14 in the closed configuration.

5 **[0118]** More in detail, the upper edge 25 is directed towards the feeding station 6 and in particular delimits the inlet mouth 4 for the passage of the filaments 7 formed by the extrusion plate.

10 **[0119]** Advantageously, the sealing means 17 comprise a first inflatable seal 40 which acts in abutment against the upper edge 25 with the movable portion 14 in the closed configuration.

[0120] The first inflatable seal 40 is advantageously placed around the extrusion plate of the feeding station 6 and preferably projects downward.

15 **[0121]** In this manner, the first inflatable seal 40 of the sealing means 17 in the expanded configuration is placed in abutment against the upper edge 25 of the containment body 11.

20 **[0122]** Preferably, the movable portion 14 of the containment body 11 is provided with a lower edge 26 at the lower end 20.

25 **[0123]** The sealing means 17 advantageously comprise a second inflatable seal 41 which acts in abutment against the lower edge 26 with the movable portion 14 in the closed configuration.

30 **[0124]** More clearly, the plant 1, object of the present invention, comprises an elongating station 27 provided with a stretching duct 28 extended along said vertical axis Y mechanically associated with the lower edge 26 of the containment body 11.

[0125] The second inflatable seal 41 is interposed between the lower edge 26 of the containment body 11 and the stretching duct 28 of the elongating station 27.

35 **[0126]** In accordance with one embodiment of the invention, the pressurized fluid circuit is configured for thrusting pressurized air within the expansion chamber of the inflatable seal in order to move it from the retracted configuration to the expanded configuration.

40 **[0127]** Advantageously, in accordance with the embodiment of the present invention illustrated in the enclosed figure 4, the sealing means 17 comprise a third inflatable seal 47 mechanically fixed to the door 39.

45 **[0128]** More in detail, the third inflatable seal 47 is fixed to an external edge of the door 39 and is extended between the upper end 19 and the lower end 20 and is configured for acting in abutment against a corresponding external edge of the other door 39 of the other movable portion 14, or, otherwise, for acting in abutment against an edge of the internal wall 21 of the containment body 11.

50 **[0129]** In order to move the inflatable seal from the expanded configuration to the retracted configuration, for example in order to move the movable portion 14 of the containment body 11 from the closed configuration to the open configuration, the sealing means advantageously comprise suction means placed in fluid connection with the expansion chamber of the inflatable seal. Such suc-

tion means are actuatable for removing the pressurized fluid housed in the expansion chamber, reducing the volume occupied by the inflatable seal itself.

[0130] The elongating station 27 is extended for a second section 3" of the main channel 3, in fluid connection with the cooling chamber 12. 5

[0131] Advantageously, the plant 1, object of the present invention, also comprises a deposition station 42 placed below the elongating station 27, along the main channel 3 and which terminates with the outlet mouth 5 for the filaments 7. 10

[0132] The deposition station 42 comprises a diffuser 45, which defines a third section 3" of the main channel 3 of the plant 1.

[0133] The diffuser 45 of the deposition station 42 is extended, widening starting from the elongating station 27, terminating with the outlet mouth 5 for the filaments 7 in order to deposit them on a conveyor belt 46. 15

[0134] In operation, the filaments 7 which cross through the diffuser 45 of the deposition station 42 tend to be woven with each other, and are therefore deposited on the conveyor belt 46 in non-woven fabric web form. 20

[0135] The plant also preferably provides for further stations, per se well-known and not the object of protection of the present patent, and hence not described in detail hereinbelow. The finding thus conceived therefore attains the pre-established objects. 25

Claims

1. Plant for producing non-woven fabric, comprising:

- a support structure (2) provided with a main channel (3) extended along a vertical axis (Y) from an upper inlet mouth (4) to a lower outlet mouth (5); 35
- a feeding station (6) placed above said main channel (3) and in communication with said inlet mouth (4) in order to introduce, in said main channel (3), filaments (7) for forming a non-woven fabric; 40
- a cooling station (8), which is placed along said main channel (3) below said feeding station (6) and comprises: 45

- a containment body (11) extended along said vertical axis (Y) between an upper end (19) and a lower end (20), and is extended around said vertical axis (Y) delimiting a cooling chamber (12) within said main channel (3); 50
- cooling means in fluid connection with said cooling chamber (12) and adapted to introduce, in said cooling chamber (12), a first air flow (10) for cooling the filaments (7) susceptible of crossing said cooling chamber (12); 55

said plant being **characterized in that:**

- said containment body (11) comprises at least two movable portions (14), arranged in a movable manner on said support structure (2);
- said plant also comprises actuator means (13) mechanically connected to said at least one movable portion (14) and arranged for moving said at least two movable portions (14) between a closed configuration, in which said containment body (11) perimetricaly closes said cooling chamber (12) at least around said vertical axis (Y), and an open configuration, in which said at least one movable portion (14) defines at least one access opening (22) which connects said cooling chamber (12) to an outside environment;
- said movable portions (14) in said closed configuration together define said cooling chamber (12), and said movable portions (14) in said open configuration together free said access opening (22);
- said plant comprises guide means (23) extended along a horizontal direction (X) substantially transverse to said vertical axis (Y), and slidably carrying, mounted thereon, said movable portions (14) of said containment body (11).

2. Plant for producing non-woven fabric according to claim 1, **characterized in that** said actuator means (13) comprise at least one pneumatic actuator (15) mechanically associated with said movable portion (14) of said containment body (11). 30

3. Plant for producing non-woven fabric according to claim 1 or 2, **characterized in that** said actuator means (13) are of automatic type, configured for moving the movable portions (14) in an automated manner. 35

4. Plant for producing non-woven fabric according to claim 3, **characterized in that** said actuator means (13) are of linear type, mounted parallel to said horizontal direction (X) in order to move said movable portions along said horizontal direction (X). 40

5. Plant for producing non-woven fabric according to claim 3 or 4, **characterized in that** it comprises motor means mechanically mounted on said support structure (2) and operatively connected to said actuator means (13) in order to actuate said actuator means (13) to move the movable portions (14) of said containment body (11) in an automated manner. 45

6. Plant for producing non-woven fabric according to any one of the preceding claims, **characterized in that** said guide means (23) comprise at least one pinion (15) rotatably constrained to said movable 50

- portion (14) of said containment body (11) and at least one rack (16) mechanically constrained to said support structure (2) engaged in a shape relationship with said at least one pinion (15) and extended parallel to said horizontal direction (X). 5
7. Plant for producing non-woven fabric according to one of the preceding claims, **characterized in that** said containment body (11) is provided with at least one openable side (24), which is extended between said upper end (19) and said lower end (20) and on which said access opening (22) is defined with said movable portion (14) in open configuration. 10
8. Plant for producing non-woven fabric according to one of the preceding claims, **characterized in that** it comprises sealing means (17) operatively associated with said at least one movable portion (14) and configured for tightly sealing said cooling chamber (12) with respect to the outside environment with said at least one movable portion (14) in said closed configuration. 15 20
9. Plant for producing non-woven fabric according to claim 8, **characterized in that** said sealing means (17) comprise at least one inflatable seal. 25
10. Plant for producing non-woven fabric according to claim 9, **characterized in that** said movable portion (14) is provided with an upper edge (25) at said upper end (19) which at least partially delimits said inlet mouth (4), with said movable portion (14) in said closed configuration; 30
said sealing means (17) comprising a first inflatable seal which acts in abutment against said upper edge (25) with said movable portion (14) in the closed configuration. 35
11. Plant for producing non-woven fabric according to claim 9 or 10, **characterized in that** said movable portion (14) is provided with a lower edge (26) at said lower end (20); 40
said sealing means (17) comprising a second inflatable seal which acts in abutment against said lower edge (26) with said movable portion (14) in the closed configuration. 45
12. Plant for producing non-woven fabric according to claim 11, **characterized in that** it comprises an elongating station (27) provided with a stretching duct (28) extended along said vertical axis (Y) mechanically associated with the lower edge (26) of said containment body (11); 50
said second inflatable seal being interposed between said lower edge (26) of said containment body (11) and said stretching duct (28) of said elongating station (27). 55
13. Plant for producing non-woven fabric according to one of the preceding claims, **characterized in that** each movable portion (14) of said containment body (11) comprises: 5
- an internal wall (21) extended transversely with respect to said horizontal direction (X) and placed in front of the first internal wall (21) of the other said internal wall (21), the internal walls (21) of said movable portions (14) together delimiting said cooling chamber (12) according to said horizontal direction (X),
- and at least one door (39), which projectingly protrudes from a perimeter edge of the internal wall (21) of said containment body (11), and is adapted to close said cooling chamber (12) with said movable portion (14) in said closed configuration.
14. Plant for producing non-woven fabric according to claim 13, **characterized in that** said cooling station (8) is provided with at least one first inlet opening (9) which places said cooling chamber (12) in fluid connection with said cooling means; said first inlet opening (9) being provided at the internal wall (21) of said containment body (11).

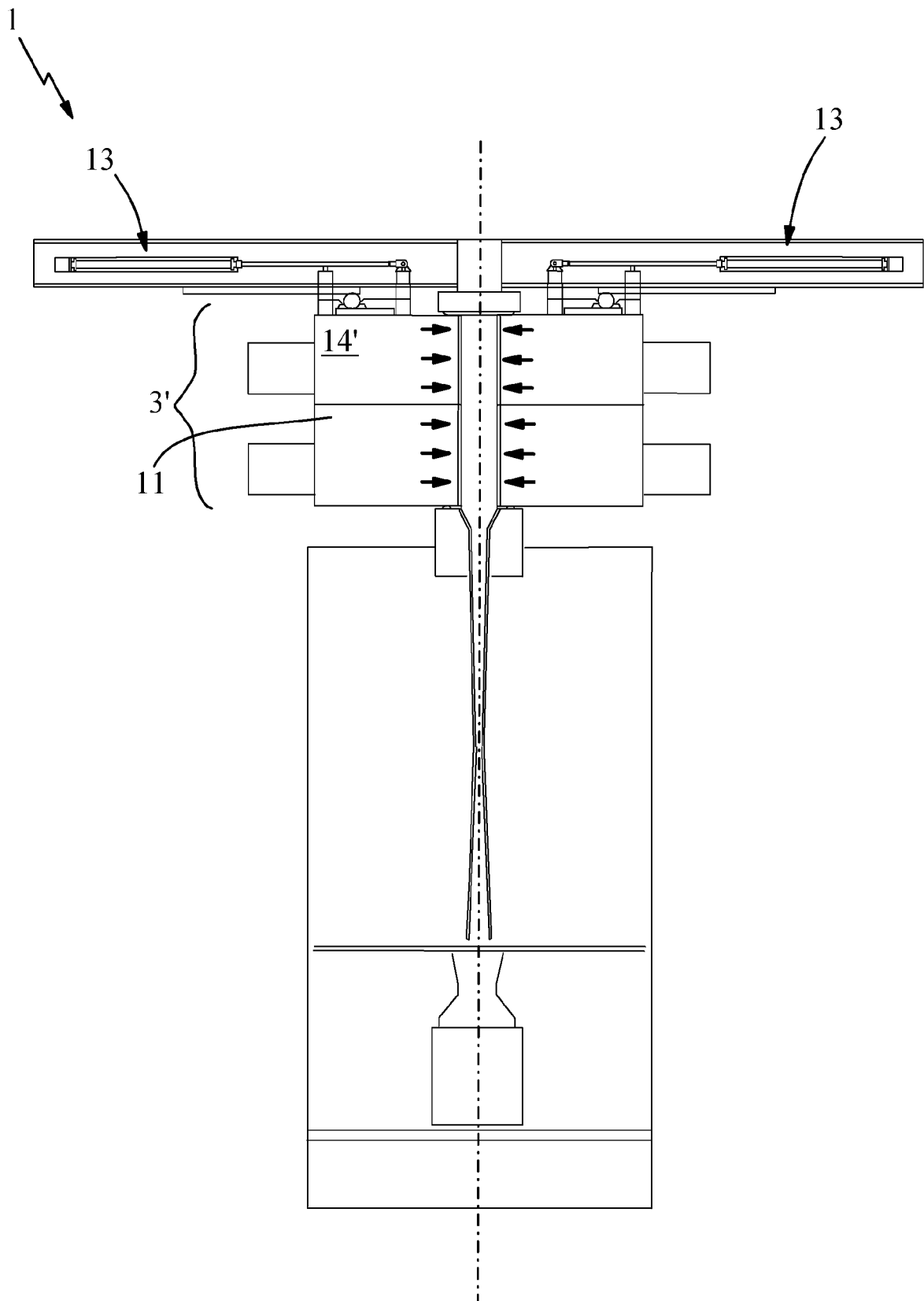


Fig. 1

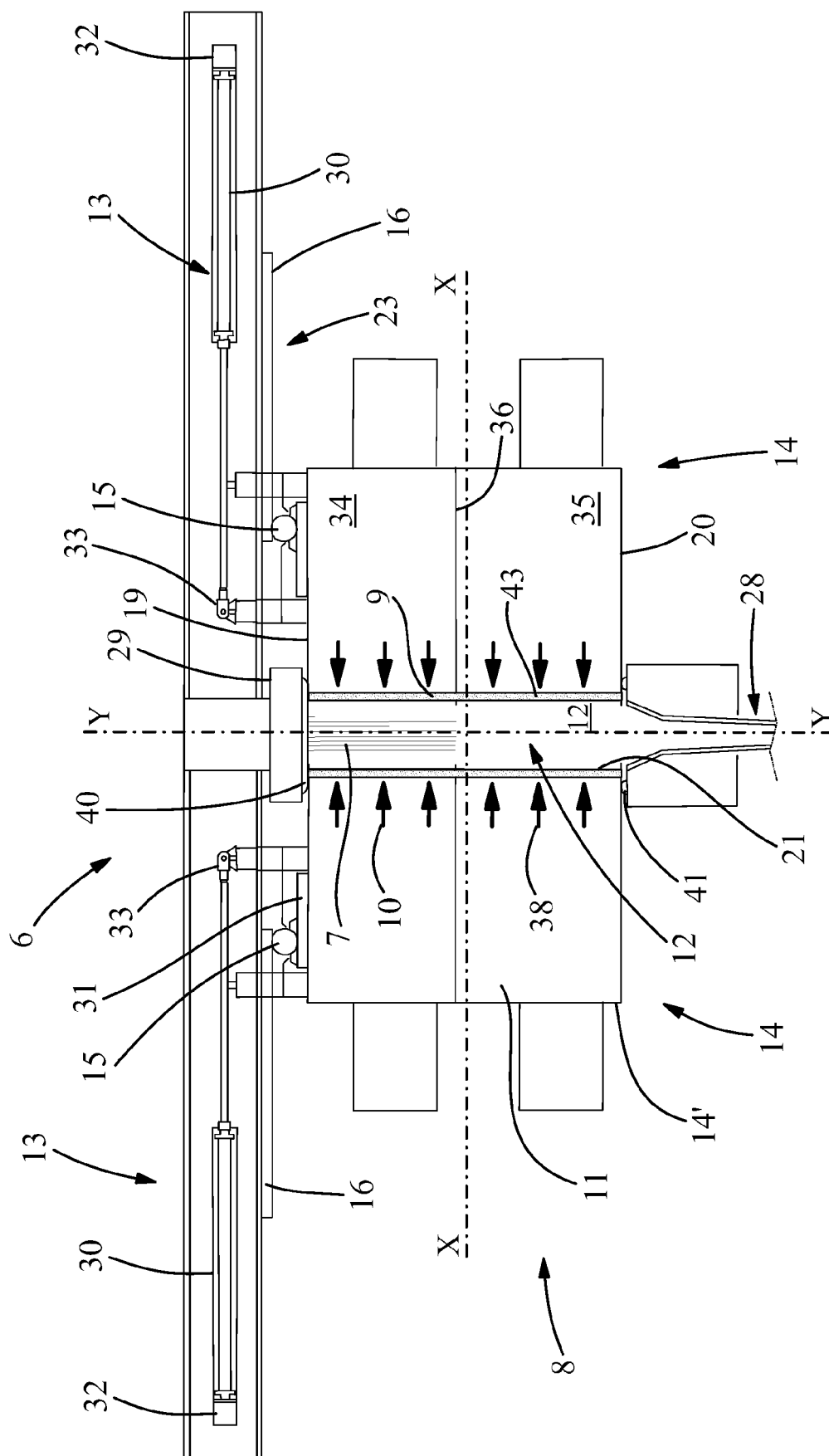


Fig. 2

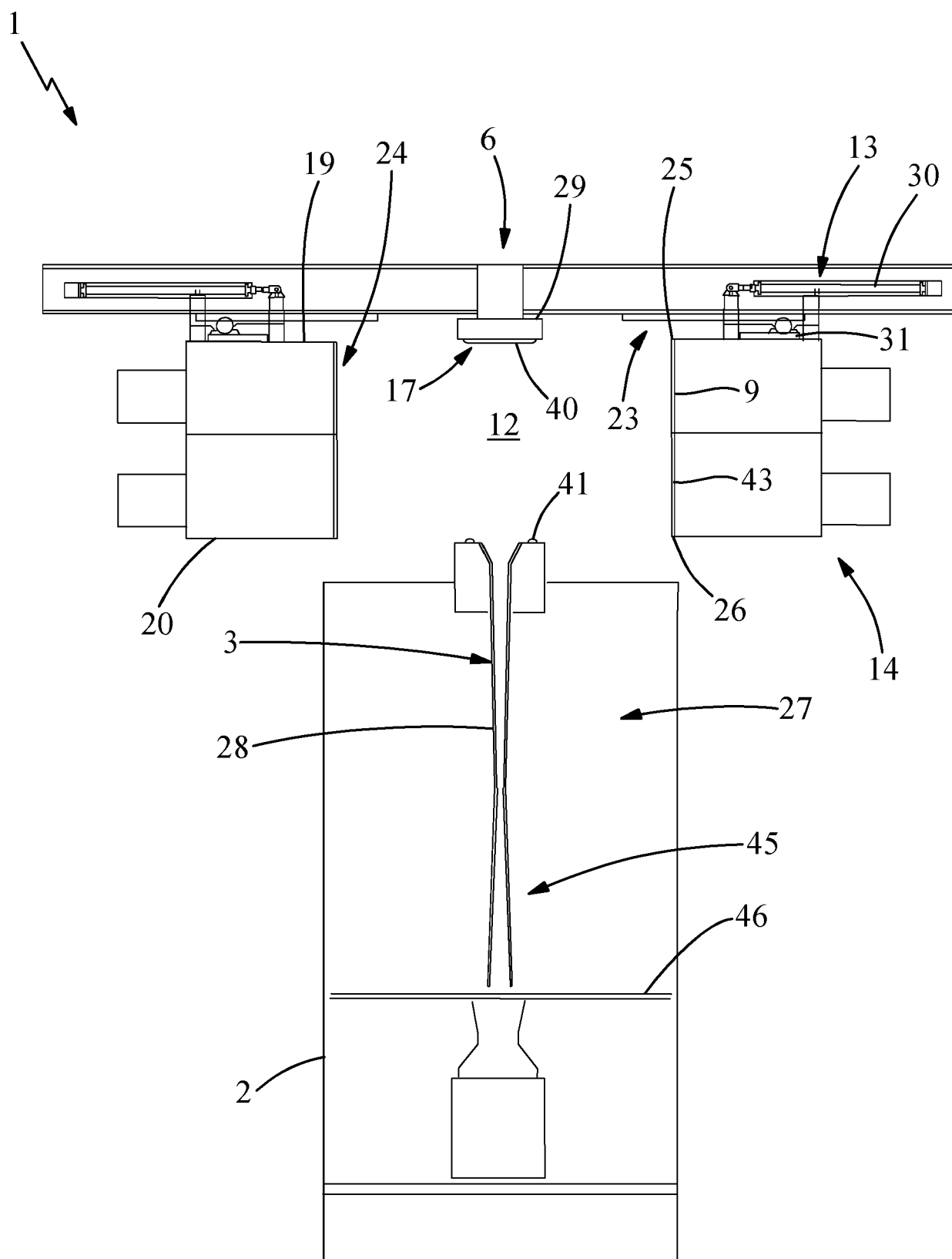


Fig. 3

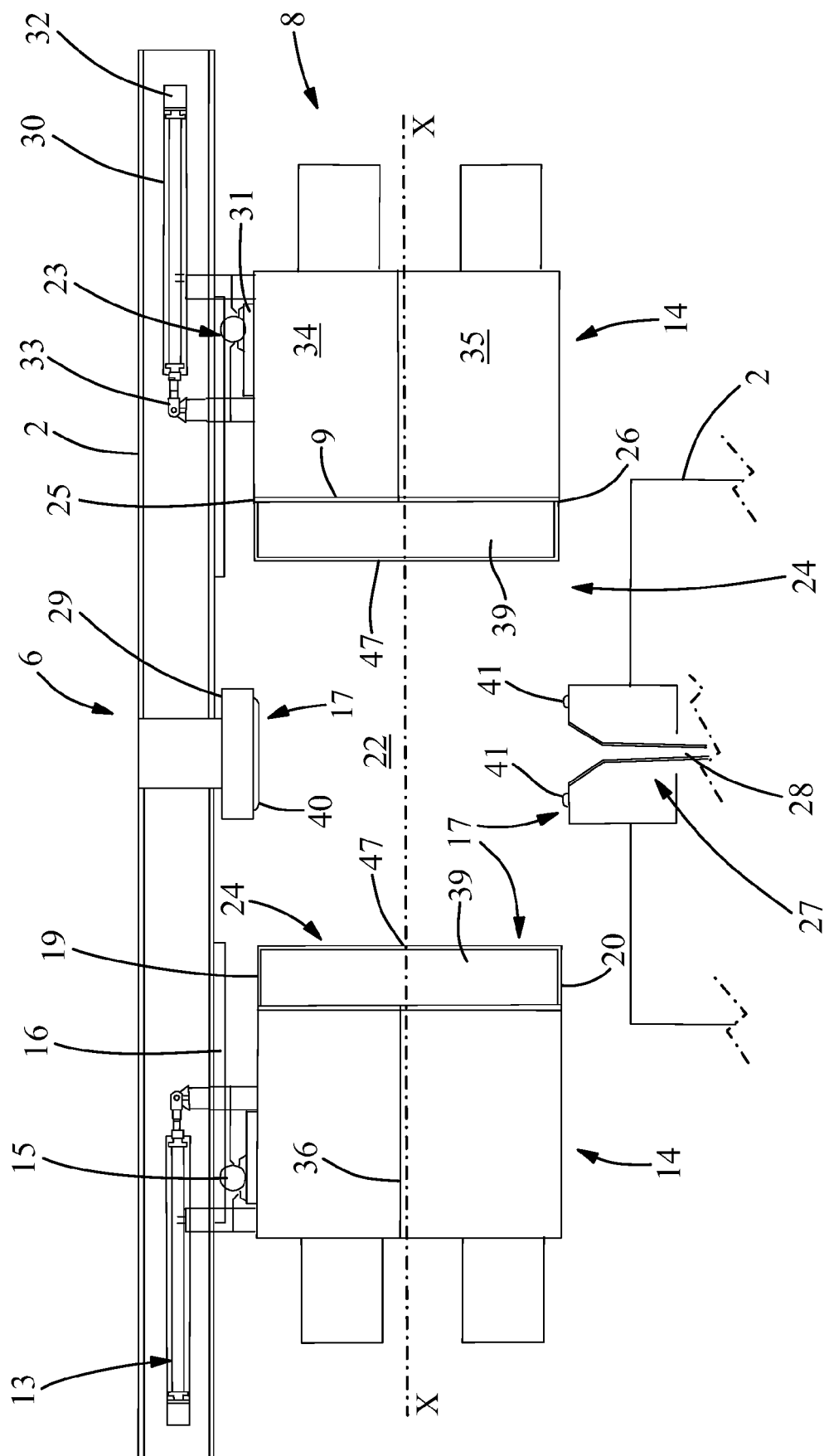


Fig. 4



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 Application Number
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Place of search Munich		Date of completion of the search 10 July 2020	Examiner Billet, Aina
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