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(54) APPARATUS AND METHOD FOR PRODUCING CIGARETTE FILTER

VORRICHTUNG UND VERFAHREN ZUR HERSTELLUNG EINES ZIGARETTENFILTERS

APPAREIL ET PROCÉDÉ DE PRODUCTION D'UN FILTRE DE CIGARETTE

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Description

Technical Field

[0001] The present invention relates to a manufacturing apparatus and a manufacturing method for a cigarette filter.

Background Art

[0002] A filter manufacturing apparatus which manufactures a cigarette filter generally includes a processing unit that feeds tow composed of filter fibers of cellulose acetate or the like from a storage container and shapes the tow into a flat band shape by stretching fibers of the tow or performing opening processing that opens up the gap between fibers in a feed process and a shaping unit that continuously shapes a filter rod by winding wrapping paper around the band-like tow supplied from the processing unit and bonding the wrapping paper to the tow while shaping the tow into a rod shape.

[0003] In the processing unit of the filter manufacturing apparatus, a liquid plasticizer, such as triacetin, is added to the band-like tow by a roll transfer method, a spray method, or the like. Inside each filter rod, filter fibers of the tow are bound together by the plasticizer. With this binding, the shape of the filter rod can be stably maintained.

[0004]

[Patent document 1] Japanese Patent Laid-Open No. 6-327455

[Patent document 2] International Publication No. WO 02/017738

[0005] EP 1106087 A1 discloses a method involving detecting the density of the moving material transverse to its direction of motion and feeding the additive to the material depending on the detected density using control elements driven by density signals for associated areas of material. The density is detected in individual material areas using light, gas, preferably air, electrical or electromagnetic fields passed through the material.

Summary of Invention

Technical Problem

[0006] Consider a case where a liquid with high viscosity, such as a solution containing a thickener, is supplied to a band of filter fibers. Application of the same roll transfer method or spray method as for a plasticizer with relatively low viscosity to the case where the high-viscosity liquid is supplied to the band of filter fibers may have the following disadvantages.

[0007] For example, if a roll transfer method is applied, filter fibers of tow wind around a roller due to adhesiveness of the high-viscosity liquid, stable delivery of the tow

along a feed path is difficult. If a spray method is applied, the high-viscosity liquid that is atomized using compressed air, gas, or the like is sprayed from a nozzle. The atomization of the high-viscosity liquid needs spraying of a large amount of compressed air has disadvantages. More specifically, filter fibers being delivered may fluctuate greatly in posture or may be unable to maintain a band shape. As a result, stable manufacture of cigarette filters may be difficult.

[0008] The present invention has been made in view of the above-described problems, and has as its object to provide a manufacturing apparatus and a manufacturing method for a cigarette filter capable of stably manufacturing a cigarette filter even if a liquid additive with high viscosity is supplied to filter fibers in a cigarette filter manufacturing process.

Solution to Problem

[0009] To solve the above-described problems, according to the present invention, a liquid additive is continuously dropped from a supply unit that is arranged at a position above and away from filter fibers fed along a feed path to an upper surface of the filter fibers located below such that the liquid additive is continuous.

[0010] More specifically, a manufacturing apparatus having the features of claim 1 is provided. Furthermore, a manufacturing method having the features of claim 9 is provided. The expression "continuously dropping the liquid additive such that the liquid additive is continuous" here refers to a state in which the liquid additive is continuous to the upper surface of the filter fibers without a break while the liquid additive dropped from the supply unit drops down (falls down) toward the upper surface of the filter fibers located below with force of gravity. Note that the term "drop down" refers not only to drop in a vertical direction but also to drop obliquely downward.

[0011] According to the present invention, even if the liquid additive has high viscosity, the liquid additive can be applied in large amounts to the filter fibers while the supply unit is estranged from the filter fibers, i.e., is out of contact with the filter fibers. For this reason, the filter fiber can be inhibited from sticking to the supply unit side due to adhesiveness of the filter fibers, and feeding of the filter fibers along the feed path can be stably performed. Additionally, according to the present invention, the liquid additive is applied to the upper surface of the filter fibers while being continuously dropped such that the liquid additive is continuous. Unlike the above-described spray method, the liquid additive need not be sprinkled in an atomized state. It is thus possible to inhibit the filter fibers fed along the feed path from fluctuating greatly in posture under effects of compressed air or compressed gas and from having difficulty in maintaining a band shape. As a result, a filter manufacturing apparatus capable of stably manufacturing cigarette filters can be provided.

[0012] In the present invention, the supply unit may

include an application nozzle that protrudes from a bottom surface of the supply unit and has an application port for dropping the liquid additive. This allows the liquid additive to be inhibited from, for example, being deposited on the bottom surface of the supply unit to form a liquid pool. The liquid additive can be accurately dropped in a desired direction by dropping the liquid additive from the application port of the application nozzle protruding the bottom surface of the supply unit.

[0013] In the present invention, a plurality of the application nozzles may be arranged in a line on the bottom surface of the supply unit. With this configuration, the liquid additive can be uniformly applied to the upper surface of the filter fibers without atomizing the liquid additive, unlike the spray method.

[0014] In the present invention, the plurality of application nozzles may be arrayed at fixed intervals. This allows further improvement of uniformity of the liquid additive applied to the upper surface of the filter fibers.

[0015] In the present invention, the plurality of application nozzles may be arrayed in a straight line along a width direction of the feed path. This allows more uniform application of the liquid additive in the width direction of the filter fibers.

[0016] In the present invention, the application device may further include a holding unit that holds the supply unit, and the holding unit may be adapted to hold the supply unit such that an angle which a direction, in which the plurality of application nozzles are arrayed, forms with the feed path is freely changeable. With this configuration, even if an opening width of the filter fibers is changed, the liquid additive can be applied to the filter fibers using the common supply unit. It is thus possible to inhibit the liquid additive from having difficulty in being applied to an end region in the width direction of the filter fibers and inhibit the liquid additive from the supply unit from being wasted without being applied to the filter fibers.

[0017] In the present invention, the application device may further include a shutter unit that receives the liquid additive dropping down from the supply unit and a drive unit that drives the shutter unit and may be adapted such that a posture of the shutter unit is switched by the drive unit between a closed posture that receives the liquid additive dropping down from the supply unit and an open posture that does not receive the liquid additive dropping down from the supply unit.

[0018] With the above-described configuration, it is possible to prevent interference with supply of the liquid additive to the filter fibers by maintaining the posture of the shutter unit in the open posture at the time of, for example, application of the liquid additive to the filter fibers by the application device. Since the posture of the shutter unit can be switched responsively from the open posture to the closed posture at the time of suspension of application of the liquid additive by the application device, the liquid additive can be inhibited from continuing to drop on the filter fibers.

[0019] In the present invention, a shaping unit that is provided at a stage subsequent to the application device in the feed path and shapes the filter fibers into a rod shape may be further provided, and the supply unit may be arranged immediately upstream of the shaping unit.

[0020] In the present invention, the application device may further include a storage unit that stores the liquid additive, connection piping that connects the storage unit and the supply unit, and pressure feed means that is annexed to the storage unit and pressure-feeds the liquid additive stored in the storage unit to the connection piping. With this configuration, even if viscosity of the liquid additive is high, the liquid additive can be stably applied to the supply unit.

[0021] Note that means for solving the problems according to the present invention can be adopted in combination wherever possible.

Advantageous Effects of Invention

[0022] The present invention allows provision of a manufacturing apparatus and a manufacturing method for a cigarette filter capable of stably manufacturing a cigarette filter even if a liquid additive with high viscosity is supplied to filter fibers in a cigarette filter manufacturing process.

Brief Description of the Drawings

[0023]

[Fig. 1] Fig. 1 is a diagram illustrating the schematic configuration of a filter manufacturing apparatus according to a first embodiment.

[Fig. 2] Fig. 2 is a diagram illustrating the schematic configuration of a liquid additive application device according to the first embodiment.

[Fig. 3] Fig. 3 is a view partially illustrating a bottom surface of a supply unit according to the first embodiment.

[Fig. 4] Fig. 4 is a view schematically illustrating the relationship between an arrayal direction of application nozzles provided on the supply unit according to the first embodiment and a movement direction of a feed path.

[Fig. 5A] Fig. 5A is a view for explaining a closed posture of a shutter unit according to the first embodiment.

[Fig. 5B] Fig. 5B is a view for explaining an open posture of the shutter unit according to the first embodiment.

[Fig. 6] Fig. 6 is a view for explaining an aspect of a thickener solution which is dropped from each application nozzle according to the first embodiment.

[Fig. 7] Fig. 7 is a view for explaining an aspect of a thickener solution which is applied to an upper surface of tow by the supply unit according to the first embodiment.

[Fig. 8] Fig. 8 is a diagram for explaining a tow processing device according to a first modification.

[Figs. 9] Figs. 9 are views for explaining a liquid additive application device according to a second modification.

[Fig. 10] Fig. 10 is a bottom view of a supply unit in a liquid additive application device according to a third modification.

[Fig. 11] Fig. 11 is a view for explaining an aspect in which a thickener solution is applied to an upper surface of tow by a supply unit according to the third modification.

[Fig. 12] Fig. 12 is a view illustrating another form of the supply unit according to the third modification.

[Fig. 13] Fig. 13 is a diagram illustrating a liquid additive application device according to a fourth modification.

Description of Embodiment

[0024] An embodiment of a manufacturing apparatus and a manufacturing method for a cigarette filter according to the present invention will be described below in detail with reference to the drawings. Unless otherwise specified, the technical scope of the invention is not limited to the dimensions, the materials, the shapes, the relative arrangement, and the like of components described in the present embodiment.

<First Embodiment>

[0025] Fig. 1 is a diagram illustrating the schematic configuration of a filter manufacturing apparatus 1 according to a first embodiment. The filter manufacturing apparatus 1 is a manufacturing apparatus for manufacturing a cigarette filter.

[0026] As illustrated in Fig. 1, the filter manufacturing apparatus 1 includes, as an example, a tow processing device 100, a rod shaping device 20 which is arranged at a stage subsequent to the tow processing device 10, and a wrapping device 30 which is arranged at a stage subsequent to the rod shaping device 20.

[0027] The tow processing device 10 includes a storage container 11 which houses and stores tow 2 composed of filter fibers of, for example, cellulose acetate fiber, and a feed path 3 extends from the storage container 11. The tow 2 can be continuously fed from the storage container 11 along the feed path 3. The tow 2 inside the storage container 11 is stored while filter fibers are put together into a cluster and are compressed.

[0028] A primary banding jet 12, a guide roller 13, one pair of pretension rollers 14, one pair of blooming rollers 15, a secondary banding jet 16, and one pair of delivery rollers 17 are arranged on the feed path 3 in order from the storage container 11. In the feed path 3, a stuffer jet 21 of the rod shaping device 20 is arranged in front of the one pair of delivery rollers 17 (on the downstream side in a feed direction of the tow 2 in the feed path 3).

A spray nozzle 18 which sprays triacetin as an example of a plasticizer over the tow 2 is provided between the secondary banding jet 16 and the one pair of delivery rollers 17 in the feed path 3. Additionally, a supply unit 41 of a liquid additive application device 40 is arranged between the one pair of delivery rollers 17 and the stuffer jet 21. The liquid additive application device 40 is a device for applying a liquid additive with high viscosity to the tow 2.

[0029] When the one pair of delivery rollers 17 is driven by a driving source (not illustrated), the tow 2 is continuously fed from the storage container 11 along the feed path 3. The primary banding jet 13 and the secondary banding jet 16 spout compressed air to the downstream side in the feed path 3, i.e., forward in the feed direction of the tow 2. When the tow 2 fed from the storage container 11 passes through the primary banding jet 13, compressed air spouted from the primary banding jet 13 opens up the gap between filter fibers of the tow 2 (performs opening) and appropriately stretches curls (crimps) of the tow 2.

[0030] The pretension rollers 14 applies predetermined tension to the tow 2 in cooperation with the one pair of blooming rollers 15 to further stretch the curls of the tow 2. For example, the pretension rollers 14 and the blooming rollers 15 are different in peripheral velocity, and the difference in peripheral velocity applies tension to the tow 2 and stretches the tow 2. The blooming rollers 15 send the tow 2, in which the gap between fibers is opened up, to the secondary banding jet 16.

[0031] The secondary banding jet 16 spouts compressed air toward the bundle of tow 2 to further open up the gap between fibers. As a result, the bundle of tow 2 spreads in a width direction of the feed path 3, and the tow 2 is formed in a flat band shape.

[0032] After passing through the secondary banding jet 16, atomized triacetin is sprinkled from the spray nozzle 18 in a spray addition unit (not illustrated) which is installed in the feed path 3 over the band-like tow 2. The spray nozzle 18 sprays, through a spray hole (not illustrated), liquid triacetin in an atomized state using compressed air, gas, or the like. The band-like tow 2 with triacetin sprinkled over a surface by the spray nozzle 18 then passes between the one pair of delivery rollers 17. Instead of installing a spray nozzle, liquid triacetin may be applied to the tow 2 by the one pair of delivery rollers 17. In this case, for example, liquid triacetin may be transferred in advance onto the one pair of delivery rollers 17, and the triacetin may be applied from the delivery rollers 17 to the tow 2 at the time of delivering the band-like tow 2 by the one pair of delivery rollers 17.

[0033] Adhesiveness is imparted to the band-like tow 2 with added triacetin due to the effect of triacetin of causing filter fibers to dissolve. A plurality of points of coupling by adhesive power are formed between adjacent filter fibers. The delivery rollers 17 deliver the tow 2 toward the stuffer jet 21 of the rod shaping device 20. Immediately before the band-like tow 2 arrives at the stuffer jet

21, i.e., immediately upstream of the stuffer jet 21 in the feed path 3, the liquid additive application device 40 applies a thickener solution as an example of a liquid additive to an upper surface of the tow 2. Note that the details of the liquid additive application device 40 will be described later.

[0034] The rod shaping device 20 includes the stuffer jet 21 that sends the tow 2 toward a tongue 22 together with air, the tongue 22 that shapes the tow 2 into a rod shape, a convergence guide (trumpet guide) 23 which is provided at a position between the stuffer jet 21 and the tongue 22, and the like. The convergence guide 23 is approximately funnel-shaped, and converges the tow 2 sent from the stuffer jet 21 to some degree while guiding the tow 2 toward the tongue 22. The tongue 22 has a tapered shape as a whole, further compresses the tow 2 sent from the convergence guide 23, and shapes the tow 2 into a bar-like rod member.

[0035] The wrapping device 30 is arranged at a stage subsequent to the rod shaping device 20, and the tow 2 shaped into a rod shape is supplied from the rod shaping device 20. In the wrapping device 30, wrapping paper is bonded to the tow 2 shaped as a rod member to obtain a filter rod FR. A cutter 31 is provided side by side with the wrapping device 30. A continuum of filter rods FR continuously delivered from the wrapping device 30 is cut by the cutter 31 to obtain the filter rod FR of predetermined length.

[0036] The configuration of the liquid additive application device 40 that the tow processing device 10 includes will be described. Fig. 2 is a diagram illustrating the schematic configuration of the liquid additive application device 40 according to the first embodiment. The liquid additive application device 40 includes a storage hopper 42 which stores a thickener solution, the supply unit 41 that is supplied with the thickener solution stored in the storage hopper 42 and supplies the thickener solution to the upper surface of the band-like tow 2 conveyed along the feed path 3, connection piping 43 which connects the storage hopper 42 and the supply unit 41, an on-off valve 44 which is installed at the connection piping 43, a pressure pump 45 which is annexed to a connection unit between the storage hopper 42 and the connection piping 43, a shutter unit 46, and the like. Note that the on-off valve 44 and the pressure pump 45 are not illustrated in Fig. 1. In the present embodiment, the storage hopper 42 corresponds to a storage unit according to the present invention, and the pressure pump 45 corresponds to pressure feed means according to the present invention.

[0037] The thickener solution stored in the storage hopper 42 is, for example, a solution containing propylene glycol, glycerin, and a thickener. The containment of propylene glycol by the thickener solution allows selective removal of a predetermined constituent contained in mainstream smoke of a cigarette, such as phenol, at the time of smoking. Limonene as one of aroma constituents passes through a filter without being removed. A commercialized product can be used as propylene glycol.

The containment of glycerin by the thickener solution allows propylene glycol contained in the thickener solution to be prevented from volatilizing and dissipating during reposition of a cigarette. A commercialized product can be used as glycerin. The containment of the thickener by the thickener solution allows the thickener solution to be prevented from moving and leaking out from a filter and satisfactory preservation of the appearance of a cigarette. Note that the type of the thickener solution is not limited to the above-described example. The viscosity of the thickener solution is not particularly limited. For example, from the viewpoint of preventing the thickener solution from moving and leaking out from a filter, the viscosity is preferably not less than 2500 cP (centipoise), more preferably not less than 3500 cP. The thickener solution may be not more than 10000 cP.

[0038] The type of the thickener is not particularly limited. Examples of the thickener can include xanthan gum, gellan gum, psyllium seed gum, pectin, carboxymethylcellulose, hydroxypropylcellulose, polyvinyl alcohol, agarose, pullulan, alginic acid, polyacrylic acid, and an alkali metal salt or alkali-earth metal salt thereof.

[0039] Reference numeral 50 illustrated in Fig. 2 denotes a control unit of the filter manufacturing apparatus 1, and the control unit is a computer which controls the operation of the entire filter manufacturing apparatus 1. The on-off valve 44 is, for example, a motor-operated valve, an electromagnetic valve, or the like. Note that the liquid additive application device 40 may not include the on-off valve 44. The pressure pump 45 may be, for example, a quantitative transfer pump, such as a Moineau pump. When the pressure pump 45 operates, the pressure pump 45 pressure-feeds the thickener solution stored in the storage hopper 42 to the connection piping 43, which results in supply of the thickener solution to the supply unit 41. The shutter unit 46 is a member having a so-called trough shape, and the posture of the shutter unit 46 can be changed between an open posture and a closed posture by a shutter driving unit 46A which is provided side by side with the shutter unit 46. Reference numeral 47 denotes a holding unit for holding the supply unit 41.

[0040] The control unit 50 of the filter manufacturing apparatus 1 is connected to a drive unit (not illustrated) of the delivery rollers 17 of the tow processing device 10, the on-off valve 44, the pressure pump 45, and the shutter driving unit 46A of the liquid additive application device 40, and the like via electric wiring. The control unit 50 controls the operation of the pieces of equipment by outputting control signals to the pieces of equipment.

[0041] Reference numeral 48 illustrated in Fig. 2 denotes an application nozzle. The supply unit 41 has a plurality of application nozzles 48. The application nozzle 48 is a tubular nozzle which protrudes downward from a bottom surface 41A of the supply unit 41, and each application nozzle 48 has an application port for dropping the thickener solution supplied to the supply unit 41 to the outside. The supply unit 41 has the shape of an ap-

proximate rectangular parallelepiped. The plurality of application nozzles 48 are arranged in a straight line in a width direction of the bottom surface 41A.

[0042] Fig. 3 partially illustrates the bottom surface 41A of the supply unit 41 according to the first embodiment. As illustrated in Fig. 3, a plurality of application nozzles 48 are arranged in a straight line along the width direction of the supply unit 41 and form a comb-shaped multiple nozzle. The application nozzles 48 are arranged at fixed intervals along a width direction of the supply unit 41. Reference character 48A denotes an application port as an opening unit for discharging the thickener solution to the outside. The inside and the outside of the supply unit 41 communicate with each other via the application port 48A. Note that, in the present embodiment, axial directions of tubular bodies forming the application nozzles 48 all coincide with one another and are perpendicular to the bottom surface 41A.

[0043] The details of an application method for applying the thickener solution to the band-like tow 2 (filter fibers) by the liquid additive application device according to the first embodiment will be described. As illustrated in Fig. 1, the supply unit 41 of the liquid additive application device 40 is arranged above the tow 2 (the feed path 3). Since the supply unit 41 of the liquid additive application device 40 is arranged between the delivery rollers 16 and the stuffer jet 21, the supply unit 41 is arranged above the tow 2 shaped into a band shape. The application port 48A of the application nozzle 48 is arranged so as to face the upper surface of the tow 2 in a state away from (out of contact with) the upper surface of the tow 2.

[0044] Fig. 4 schematically illustrates the relationship between an arrayal direction of the application nozzles 48 provided on the supply unit 41 according to the first embodiment and a movement direction of the feed path 3. The application nozzles 48 are arrayed along a direction orthogonal to the movement direction of the feed path 3. That is, the plurality of application nozzles 48 are arrayed along the width direction of the feed path 3, i.e., a width direction of the tow 2 shaped into a band shape.

[0045] The operation of the liquid additive application device 40 when the thickener solution is applied to the band-like tow 2 will be described. Since the tow 2 is constantly fed along the feed path 3 while the filter manufacturing apparatus 1 is in operation, the thickener solution is continuously applied to the tow 2 by the liquid additive application device 40. The control unit 50 outputs a driving signal to a drive unit of the one pair of delivery rollers 16 at the start of operation of the filter manufacturing apparatus 1. With the driving signal, conveyance of the tow 2 along the feed path 3 is started. The control unit 50 also sends an open signal to the shutter driving unit 46A of the shutter mechanism 46. With the open signal, the shutter driving unit 46A drives the shutter unit 46, and the posture of the shutter unit 46 is switched from the closed posture to the open posture.

[0046] Fig. 5A is a view for explaining the closed posture of the shutter unit 46 according to the first embodiment.

Fig. 5B is a view for explaining the open posture of the shutter unit 46. The shutter driving unit 45A can switch the posture (position) of the shutter unit 46 between the closed posture (closed position) illustrated in Fig. 5A and the open posture (open position) illustrated in Fig. 5B. When the shutter unit 46 is in the closed posture, the shutter unit 46 is arranged below the application port 48A so as to receive the thickener solution discharged from the application port 48A in the application nozzle 48 (Fig. 5A). On the other hand, when the shutter unit 46 is in the open posture, the shutter unit 46 is in a state after the shutter unit 46 is moved rotationally by approximately 90° from the open position. The shutter unit 46 retracts from below the application port 48A in the application nozzle 48 (Fig. 5B).

[0047] At the start of operation of the filter manufacturing apparatus 1, the control unit 50 outputs control signals to the on-off valve 44 and the pressure pump 45 of the liquid additive application device 40 to open the on-off valve 44 and bring the pressure pump 45 into operation. With this operation, pressure feeding of the thickener solution stored in the storage hopper 42 to the supply unit 41 is started. Note that the filter manufacturing apparatus 1 according to the present embodiment may be provided with a rotary encoder (not illustrated) which detects the rotational speed of the delivery rollers 17 and that the control unit 50 may acquire the rotational speed of the delivery rollers 17 on the basis of an output signal from the rotary encoder. Additionally, the control unit 50 may be triggered by sensing, on the basis of the rotational speed of the delivery rollers 17, that the feed path 3 is fed by the delivery rollers 17 to control the on-off valve 44, the pressure pump 45, and the shutter driving unit 46A of the liquid additive application device 40 in the above-described manner.

[0048] The thickener solution supplied to the supply unit 41 through the connection piping 43 is distributed into tubular bodies of the application nozzles 48 and is then discharged to the outside through the application ports 48A. Since the thickener solution contains a thickener, the thickener solution can be said to be a high-viscosity liquid additive much higher in viscosity than a plasticizer and the like. In view of the thickener solution having high viscosity, in the present embodiment, the thickener solution is applied to the tow 2 by continuously dropping the thickener solution from the supply unit 41 that is arranged at a position above the band-like tow 2 (filter fibers) fed along the feed path 3 and away from the tow 2 to the upper surface of the tow 2 located below such that the thickener solution is continuous. The expression "continuously dropping the thickener solution ... such that the thickener solution is continuous" here refers to a state in which the thickener solution is continuous to the upper surface of the tow 2 without a break while the thickener solution continuously forced out from the application port 48A of each application nozzle 48 by a pump pressure drops (falls) down toward the upper surface of the tow 2 with the force of gravity, as illustrated

in Fig. 6. Note that the distance between the upper surface of the tow 2 and the application port 48A in the application nozzle 48 is drawn to be larger in Fig. 6 for ease of comprehension of an aspect of the thickener solution dropped from the application nozzle 48. Note that when the thickener solution drops down from the application port 48A of the application nozzle 48, the thickener solution may fall perpendicularly downward or may fall down obliquely. An aspect in which the thickener solution falling down is stretched due to adhesiveness of the thickener solution applied to the upper surface of the tow 2 conveyed along the feed path 3 to drop obliquely downward from the application port 48A of the application nozzle 48 can also be conceived.

[0049] The liquid additive application device 40 can apply a large amount of thickener solution to the tow 2 while the supply unit 41 (the application port 48A of the application nozzle 48) is estranged from the tow 2, i.e., is out of contact with the tow 2 even when a liquid additive with high viscosity like the thickener solution is to be supplied to the tow 2. For this reason, the problem of filter fibers of the tow 2 sticking to the supply unit 41 side due to the adhesiveness of the thickener solution does not occur. Thus, delivery of the tow 2 along the feed path 3 can be stably performed.

[0050] Since the method for applying a thickener solution according to the present embodiment applies a thickener solution to the upper surface of the tow 2 while continuously dropping a thickener solution such that the thickener solution is continuous, the thickener solution need not be sprinkled in an atomized state, unlike the above-described spray method. It is thus possible to inhibit the tow 2 fed along the feed path 3 from fluctuating greatly in posture under effects of compressed air or compressed gas and from having difficulty in maintaining a band shape. As a result, cigarette filters can be stably manufactured using the filter manufacturing apparatus 1.

[0051] In the present embodiment, the application nozzle 48 protrudes downward from the bottom surface 41A of the supply unit 41. For this reason, even if the viscosity of the thickener solution is high, parts of the thickener solution discharged from the adjacent application ports 48A can be inhibited from sticking together to form a liquid pool on the bottom surface 41A. It is thus possible to stably apply the thickener solution to the upper surface of the tow 2. Additionally, the thickener solution can be accurately dropped in a desired direction by dropping the thickener solution from the application port 48A of the application nozzle 48 protruding from the bottom surface 41A of the supply unit 41. That is, since directionality when the thickener solution is dropped from the application nozzle 48 is higher, the effect of inhibiting parts of the thickener solution discharged from the adjacent application nozzles 48 from sticking together can be expected. Note that a structure in which an application port may be directly drilled in the bottom surface 41A of the supply unit 41 and the thickener solution is discharged from the application port may be adopted in the present

embodiment. From the viewpoint of inhibiting the thickener solution from being deposited on an end face (hereinafter referred to as a "nozzle distal end surface") of an outer peripheral unit surrounding the application port 48A in the application nozzle 48 and formation of a liquid pool, the thickness of a distal end (a dimension in a radial direction of a distal end surface) of the application nozzle 48 is preferably small.

[0052] As described with reference to Fig. 4, the application nozzles 48 on the supply unit 41 of the liquid additive application device 40 are arrayed along the width direction of the feed path 3, i.e., the width direction of the tow 2 shaped into a band shape. For this reason, the thickener solution can be uniformly applied to the upper surface of the tow 2 without atomizing the thickener solution, unlike the spray method. In the present embodiment, in particular, the plurality of application nozzles 48 are arranged at fixed intervals on the bottom surface 41A of the supply unit 41. Thus, as illustrated in Fig. 7, the thickener solution can be continuously applied at fixed intervals in the width direction of the tow 2 along a longitudinal direction (feed direction 3) of the tow 2. The application allows further improvement of uniformity of the thickener solution applied to the upper surface of the tow 2 in the width direction of the tow 2.

[0053] Note that the distance (hereinafter referred to as a "nozzle arrayal width") between ones at two ends (hereinafter referred to as end nozzles) of the plurality of application nozzles 48 arrayed in a straight line on the supply unit 41 is adjusted in accordance with an opening width of the tow 2 such that the distance is not excessively smaller or larger than the opening width of the tow 2 and that the end nozzles are aligned near ends in the width direction of the tow 2, as illustrated in Fig. 4 in the present embodiment. With this configuration, the nozzle arrayal width is not excessively smaller than the opening width of the tow 2, and a situation in which the thickener solution is not applied to end regions in the width direction of the tow 2 can be avoided. Since the nozzle arrayal width is not excessively larger than the opening width of the tow 2, the thickener solution discharged from the application nozzle 48 can be inhibited from being wasted without being applied to the tow 2.

[0054] From the viewpoint of improving the uniformity of the thickener solution applied to the tow 2, the interval between the plurality of application nozzles 48 provided on the supply unit 41 (hereinafter referred to as a "nozzle interval") is preferably small. Note that if the nozzle interval is too small, parts of the thickener solution discharged from the adjacent application nozzles 48 may stick together to deteriorate the uniformity of the thickener solution applied to the upper surface of the tow 2. The nozzle interval for the application nozzles 48 may be made as small as possible within a range which keeps parts of the thickener solution discharged from the adjacent application nozzles 48 from sticking together. Note that the shape, the dimensions, and the like of the application nozzle 48 are not particularly limited. By way of

example, the nozzle interval for the application nozzles 48 may be selected and determined from the range of about 1 to 20 mm. The bore of the application port 48A in the application nozzle 48 may be selected and determined from the range of, for example, about 0.1 to 2 mm. The length of the connection piping 43 of the liquid additive application device 40 is preferably as short as possible. Reduction of the length of the connection piping 43 has the advantage in that the supplied amount of thickener solution to be sent to the supply unit 41 from when a stop signal is issued from the control unit 50 to the pressure pump 45 to when the pressure pump 45 is depressurized can be made smaller.

[0055] The liquid additive application device 40 according to the present embodiment is structured such that the pressure pump 45 is annexed to the storage hopper 42 and such that the thickener solution stored in the storage hopper 42 is pressure-fed to the connection piping 43. This structure allows stable supply of the thickener solution with high viscosity to the supply unit 41. That is, for example, if a pressure pump is installed halfway through the connection piping 43, a zone between the storage hopper 42 and the pressure pump in the connection piping 43 may be clogged or the thickener solution may not flow from the storage hopper 42 into the zone due to low fluidity of the thickener solution. This may make it difficult to stably supply the thickener solution to the supply unit 41. To cope with the difficulty, a pump pressure of the pressure pump 45 can be applied across the connection piping 43 by not providing the pressure pump 45 halfway through the connection piping 43 but annexing the pressure pump 45 to the storage hopper 42. For this reason, even if the viscosity of the thickener solution is high, it is possible to inhibit the zone between the storage hopper 42 and the pressure pump in the connection piping 43 from being clogged and the zone from stopping being refilled with the thickener solution. As a result, supply of the thickener solution from the storage hopper 42 to the supply unit 41 can be stably performed. Note that a pressure pump may be installed halfway through the connection piping 43.

[0056] In the present embodiment, the supply unit 41 of the liquid additive application device 40 is arranged immediately upstream of the stuffer jet 21 and the convergence guide 23 of the rod shaping device 20. As described above, the arrangement of the supply unit 41 on the downstream side of the delivery rollers 16 of the tow processing device 10 in the feed path 3 allows the thickener solution applied to the tow 2 to be inhibited from being deposited on a roller member. The supply unit 41 is arranged immediately upstream of the stuffer jet 21 and the convergence guide 23, and the tow 2 can be passed to the rod shaping device 20 immediately after application of the thickener solution. Thus, downward flexure of the tow 2 arising from the weight of the thickener solution can be reduced, and delivery of the tow 2 along the feed path 3 can be stably performed.

[0057] Note that the vertical clearance between the ap-

plication port 48A of the application nozzle 48 and the tow 2 is preferably small. This is because if the vertical clearance between the application nozzle 48 and the tow 2 is too large, a part of the thickener solution discharged from the application port 48A is likely to stick to and be integrated with a part of the thickener solution discharged from the adjacent application port 48A while falling down. Note that if the vertical clearance between the application port 48A of the application nozzle 48 and the tow 2 is too small, when the tow 2 delivered from the delivery rollers 16 flutters up and down, the application nozzle 48 may come into contact with the upper surface of the tow 2. The vertical distance between the application port 48A of the application nozzle 48 and the tow 2 is preferably set to be small within a range which keeps the application nozzle 48 from coming into contact with the upper surface even if the tow 2 fed along the feed path 3 flutters to some degree. A holddown guide for holding down flutters of the tow 2 may be installed above the tow 2. That is, the upper surface of the tow 2 can be inhibited from coming into contact with the application nozzle 48 by holding down the upper surface of the tow 2 with the holddown guide when the tow 2 fed along the feed path 3 flutters up and down. Note that the holddown guide is preferably provided near a position where the application nozzle 48 is arranged in the feed path 3. The holddown guide is particularly preferably installed immediately upstream of the position where the application nozzle 48 is arranged.

[0058] The control unit 50 causes the liquid additive application device 40 to stop applying the thickener solution to the tow 2, for example, when the filter manufacturing apparatus 1 is to be stopped. That is, the control unit 50 outputs control signals to the on-off valve 44 and the pressure pump 45 of the liquid additive application device 40 to close the on-off valve 44 and stop the pressure pump 45. The control unit 50 also sends a closed signal to the shutter driving unit 46A of the shutter unit 46. With the closed signal, the shutter driving unit 46A drives the shutter unit 46 to switch the posture of the shutter unit 46 from the open posture to the closed posture. The shutter unit 46 moves below the application port 48A so as to receive the thickener solution discharged from the application port 48A in the application nozzle 48. The thickener solution can be inhibited from continuing to drop from the application port 48A through inertia after the pressure pump 45 is stopped. Note that the control unit 50 may be triggered by sensing, on the basis of a signal from the rotary encoder, that the rotational speed of the delivery rollers 17 is not more than a predetermined rotational speed to close the on-off valve 44 and stop the pressure pump 45 and switch the posture of the shutter unit 46 from the open posture to the closed posture.

<Modifications>

[0059] Modifications of the embodiment will be described. Fig. 8 is a diagram for explaining the tow

processing device 10 according to a first modification. The tow processing device 10 according to the first modification includes a first support guide 18A and a second support guide 18B for inhibiting flexure of the tow 2 fed in a movement direction along the feed path 3. The first support guide 18A is arranged between the supply unit 41 of the liquid additive application device 40 and the stuffer jet 21 of the rod shaping device 20 on the feed path 3. More specifically, the first support guide 18A is arranged immediately downstream of the supply unit 41. The second support guide 18B is arranged between the delivery rollers 16 and the supply unit 41 on the feed path 3. More specifically, the second support guide 18B is arranged immediately upstream of the supply unit 41. The first support guide 18A and the second support guide 18B each have a support surface which is arranged so as to face a lower surface of the tow 2 and inhibit flexure of the tow 2 by supporting the tow 2 with the support surfaces.

[0060] The first support guide 18A supports the tow 2 weighted by application of a thickener solution. The first support guide 18A can reduce downward flexure of the tow 2 arising from the weight of the thickener solution, which allows stable supply of the tow 2 to the stuffer jet 21 of the rod shaping device 20. The second support guide 18B supports the lower surface of the tow 2 immediately prior to application of the thickener solution from below and can inhibit the distance from the application port 48A in the application nozzle 48 to the tow 2 from deviating greatly from a set dimension. It is thus possible to inhibit an upper surface of the tow 2 from coming into contact with the application port 48A of the application nozzle 48 and inhibit parts of the thickener solution discharged from the adjacent application nozzles 48 from sticking and being integrated together while dropping down due to a too-large distance between the application port 48A in the application nozzle 48 and the tow 2.

[0061] Figs. 9 are views for explaining a liquid additive application device according to a second modification. In the liquid additive application device according to the second modification, the holding unit 47 holds the supply unit 41 such that an angle (hereinafter referred to as a "nozzle arrayal angle") which a direction (hereinafter referred to as a "nozzle arrayal direction"), in which a plurality of application nozzles 48 in the supply unit 41 are arrayed, forms with a movement direction of the feed path 3 is freely changeable. The nozzle arrayal direction is orthogonal to the movement direction of the feed path 3 in Fig. 8(a) while the nozzle arrayal direction is inclined with respect to the movement direction of the feed path 3 in Fig. 8(b). According to the present modification, the angle which the nozzle arrayal direction forms with the movement direction of the feed path 3 can be changed in accordance with the opening width of the tow 2. In the examples illustrated in Figs. 8, an opening width W2 of the tow 2 illustrated in Fig. 8(b) is smaller than an opening width W1 of the tow 2 illustrated in Fig. 8(a). The supply units 41 illustrated in Figs. 9(a) and 9(b) are common

(shared or identical) members and are made different only in nozzle arrayal angle by the holding unit 47.

[0062] The opening width of the tow 2 can be changed depending on the type of the tow 2 and various conditions of the tow processing device 10. According to the present modification, the clearance between end nozzles along a width direction of the feed path 3 can be changed to an appropriate distance in accordance with the opening width of the tow 2. As a result, even if the opening width of the tow 2 is changed with, for example, specification changes regarding cigarette filter manufacture or the like, the thickener solution can be applied to the tow 2 using the common supply unit 41. That is, it is thus possible to inhibit the thickener solution from having difficulty in being applied to an end region in a width direction of the tow 2 and inhibit the thickener solution discharged from the application nozzle 48 from being wasted without being applied to the tow 2. Note that although the supply unit 41 is provided at one site in the liquid additive application device 40 according to the present embodiment, the supply units 41 may be arranged at a plurality of positions along the feed path 3 in a multistage configuration.

[0063] Fig. 10 is a bottom view of the supply unit 41 in the liquid additive application device 40 according to a third modification. As illustrated in the third modification, the application nozzle 48 described so far may not be provided on the lower surface 41A of the supply unit 41. In the present modification, a slit-like opening unit, through which a thickener solution is dropped to the outside, is formed as an application port 41B in the lower surface 41A of the supply unit 41. In the supply unit 41 illustrated in Fig. 10, the application port 41B extends widely along a width direction of the bottom surface 41A. Fig. 11 is a view for explaining an aspect in which a thickener solution is applied to an upper surface of the tow 2 by the supply unit 41 according to the third modification. A width dimension of the application port 41B in the supply unit 41 corresponds roughly to the opening width when the band-like tow 2 arrives at the supply unit 41 and is set to a dimension slightly smaller than the opening width. In a method for applying a thickener solution according to the present modification as well, a thickener solution is dropped down (made to fall down) from a position above the tow 2 and away from the tow 2 by a predetermined dimension to the upper surface of the band-like tow 2 fed along the feed path 3 such that the thickener solution is continuous, and the thickener solution is applied while being continuously dropped to the upper surface of the tow 2. This overcomes disadvantages when a thickener solution is supplied to the tow 2 by a conventional roll transfer method or spray method. As a result, stable manufacture of cigarette filters using the filter manufacturing apparatus 1 is implemented. As another form of the supply unit 41 according to the third modification described with reference to Fig. 10, the flat application nozzle 48 may be provided to protrude around a slit-like opening unit formed in the lower surface 41A of the supply unit 41, as illustrated in Fig. 12. A structure

in which a thickener solution is dropped from the application port 48A of the application nozzle 48 may be adopted.

[0064] Fig. 13 is a diagram illustrating the liquid additive application device 40 according to a fourth modification. In the liquid additive application device 40 according to the fourth modification, a pressure pump 45A (pressure feed means) which pressurizes the entire storage chamber of the storage hopper 42 may be annexed to the storage hopper 42. As described above, since it may take some time from when a pump stop signal from the control unit 50 is issued to when a pump pressure in a pump which pressurizes the entire storage chamber of the storage hopper 42 is relieved, the on-off valve 44 is preferably installed at the connection piping 42.

[0065] The preferred embodiment of the present invention has been described above. Various changes, improvements, combinations, and the like may be made to the embodiment.

Reference Signs List

[0066]

1	filter manufacturing apparatus
2	tow
3	feed path
11	storage container
17	delivery roller
20	rod shaping device
30	wrapping device
40	liquid additive application device
41	supply unit
46	shutter unit
47	holding unit
48	application nozzle
48A	application port

Claims

1. A manufacturing apparatus (1) for a cigarette filter, comprising:

a feed mechanism that continuously feeds a band of filter fibers along a predetermined feed path (3);

an application device (40) that applies a liquid additive to the filter fibers fed along the feed path (3); and

a shaping unit that is provided at a stage subsequent to the application device (40) in the feed path (3) and shapes the filter fibers into a rod shape,

wherein the application device (40) includes a supply unit (41) that is arranged above and away from the filter fibers fed along the feed path (3) and continuously drops the liquid additive to

an upper surface of the filter fibers located below such that the liquid additive is continuous, and the supply unit (41) is arranged immediately upstream of the shaping unit.

2. The manufacturing apparatus for the cigarette filter according to claim 1, wherein the supply unit (41) includes an application nozzle (48) that protrudes from a bottom surface (41A) of the supply unit (41) and has an application port (48A) for dropping the liquid additive.
3. The manufacturing apparatus for the cigarette filter according to claim 2, wherein a plurality of the application nozzles (48) are arranged in a line on the bottom surface (41A) of the supply unit (41).
4. The manufacturing apparatus for the cigarette filter according to claim 3, wherein the plurality of application nozzles (48) are arrayed at fixed intervals.
5. The manufacturing apparatus for the cigarette filter according to claim 3 or 4, wherein the plurality of application nozzles (48) are arrayed in a straight line along a width direction of the feed path (3).
6. The manufacturing apparatus for the cigarette filter according to any one of claims 3 to 5, wherein the application device (40) further includes a holding unit (47) that holds the supply unit (41), and the holding unit (47) holds the supply unit (41) such that an angle which a direction, in which the plurality of application nozzles (48) are arrayed, forms with the feed path (3) is freely changeable.
7. The manufacturing apparatus for the cigarette filter according to any one of claims 1 to 6, wherein the application device (40) further includes a shutter unit (46) that receives the liquid additive dropping down from the supply unit (41) and a drive unit that drives the shutter unit (46), and a posture of the shutter unit (46) is switched by the drive unit between a closed posture that receives the liquid additive dropping down from the supply unit (41) and an open posture that does not receive the liquid additive dropping down from the supply unit (41).
8. The manufacturing apparatus for the cigarette filter according to any one of claims 1 to 7, wherein the application device (40) further includes a storage unit that stores the liquid additive, connection piping (43) that connects the storage unit and the supply unit (41), and pressure feed means that is annexed to the storage

unit and pressure-feeds the liquid additive stored in the storage unit to the connection piping (43).

9. A manufacturing method for manufacturing a cigarette filter for applying a liquid additive to a band of filter fibers that are continuously fed along a predetermined feed path (3), comprising continuously dropping the liquid additive from a supply unit (41) that is arranged at a position above and away from the filter fibers fed along the feed path (3) to an upper surface of the filter fibers located below such that the liquid additive is continuous, wherein a shaping unit that shapes the filter fibers into a rod shape is provided at a stage subsequent to the supply unit (41) in the feed path (3), and the liquid additive is dropped to the upper surface of the filter fibers immediately before the filter fibers fed along the feed path (3) arrive at the shaping unit. 5 10 15
10. The manufacturing method for the cigarette filter according to claim 9, wherein the supply unit (41) includes an application nozzle (48) that protrudes from a bottom surface (41A) of the supply unit (41) and has an application port (48A) for dropping the liquid additive. 20 25
11. The manufacturing method for the cigarette filter according to claim 10, wherein a plurality of the application nozzles (48) are arranged in a line on the bottom surface (41A) of the supply unit (41). 30
12. The manufacturing method for the cigarette filter according to claim 11, wherein the plurality of application nozzles (48) are arrayed at fixed intervals. 35
13. The manufacturing method for the cigarette filter according to claim 11 or 12, wherein the plurality of application nozzles (48) are arrayed in a straight line along a width direction of the feed path (3). 40
14. The manufacturing method for the cigarette filter according to any one of claims 11 to 13, wherein the supply unit (41) is held such that a direction, in which the plurality of application nozzles (48) are arrayed, forms with the feed path (3) is freely changeable. 45 50
15. The manufacturing method for the cigarette filter according to any one of claims 9 to 14, wherein switching between application of the liquid additive to the filter fibers and suspension of the application is performed by switching a posture of a shutter unit (46) that receives the liquid additive dropping down from the supply unit (41) between a closed posture that receives the liquid additive dropping down from 55

the supply unit (41) and an open posture that does not receive the liquid additive dropping down from the supply unit (41).

16. The manufacturing method for the cigarette filter according to any one of claims 9 to 15, wherein the liquid additive is supplied to the supply unit (41) via connection piping (43) that is connected to a storage unit that stores the liquid additive, and pressure feed means is annexed to the storage unit, and the liquid additive stored in the storage unit is supplied to the supply unit (41) by pressure-feeding the liquid additive to the connection piping (43) by the pressure feed means.

Patentansprüche

1. Herstellungseinrichtung (1) für einen Zigarettenfilter, umfassend:

einen Vorschubmechanismus, der ein Band aus Filterfasern kontinuierlich entlang eines vorbestimmten Vorschubpfades (3) vorschiebt;
eine Auftragsvorrichtung (40), die einen flüssigen Zusatzstoff auf die Filterfasern aufträgt, die entlang des Vorschubpfades (3) vorgeschoben werden; und
eine Formeinheit, die an einer an die Auftragsvorrichtung (40) im Vorschubpfad (3) anschließenden Stufe bereitgestellt ist und die Filterfasern in eine Stangenform formt, wobei die Auftragsvorrichtung (40) einschließt eine Zuführeinheit (41), die über und entfernt von den entlang des Vorschubpfades (3) vorgeschobenen Filterfasern eingerichtet ist und den flüssigen Zusatzstoff kontinuierlich derart auf eine obere Fläche der darunter befindlichen Filterfasern tropft, dass der flüssige Zusatzstoff kontinuierlich ist, und die Zuführeinheit (41) unmittelbar stromaufwärts der Formeinheit eingerichtet ist.
2. Herstellungseinrichtung für den Zigarettenfilter nach Anspruch 1, wobei die Zuführeinheit (41) eine Auftragsdüse (48) einschließt, die aus einer unteren Fläche (41A) der Zuführeinheit (41) herausragt und eine Auftragsöffnung (48A) aufweist, um den flüssigen Zusatzstoff aufzutropfen.
3. Herstellungseinrichtung für den Zigarettenfilter nach Anspruch 2, wobei eine Vielzahl der Auftragsdüsen (48) an der unteren Fläche (41A) der Zuführeinheit (41) in einer Linie eingerichtet sind.
4. Herstellungseinrichtung für den Zigarettenfilter nach

Anspruch 3, wobei die Vielzahl von Auftragsdüsen (48) in festen Intervallen angeordnet sind.

5. Herstellungseinrichtung für den Zigarettenfilter nach Anspruch 3 oder 4, wobei die Vielzahl von Auftragsdüsen (48) entlang einer Breitenrichtung des Vorschubpfades (3) in einer geraden Linie angeordnet sind.
6. Herstellungseinrichtung für den Zigarettenfilter nach einem der Ansprüche 3 bis 5, wobei die Auftragsvorrichtung (40) weiter eine Halteeinheit (47) einschließt, die die Zuführeinheit (41) hält, und die Halteeinheit (47) die Zuführeinheit (41) derart hält, dass ein Winkel, den eine Richtung, in der die Vielzahl von Auftragsdüsen (48) angeordnet sind, mit dem Vorschubpfad (3) bildet, frei verändert werden kann.
7. Herstellungseinrichtung für den Zigarettenfilter nach einem der Ansprüche 1 bis 6, wobei die Auftragsvorrichtung (40) weiter eine Verschlusseinheit (46), die den aus der Zuführeinheit (41) heruntertropfenden flüssigen Zusatzstoff aufnimmt, und eine Antriebseinheit einschließt, die die Verschlusseinheit (46) antreibt, und eine Stellung der Verschlusseinheit (46) von der Antriebseinheit zwischen einer geschlossenen Stellung, die den aus der Zuführeinheit (41) heruntertropfenden flüssigen Zusatzstoff aufnimmt, und einer offenen Stellung umgeschaltet wird, die den aus der Zuführeinheit (41) heruntertropfenden flüssigen Zusatzstoff nicht aufnimmt.
8. Herstellungseinrichtung für den Zigarettenfilter nach einem der Ansprüche 1 bis 7, wobei die Auftragsvorrichtung (40) weiter einschließt eine Speichereinheit, die den flüssigen Zusatzstoff speichert, Verbindungsverrohrung (43), die die Speichereinheit und die Zuführeinheit (41) verbindet, und Druckspeisungsmittel, die an die Speichereinheit angeschlossen sind und den in der Speichereinheit gespeicherten flüssigen Zusatzstoff unter Druck in die Verbindungsverrohrung (43) speisen.
9. Herstellungsverfahren zur Herstellung eines Zigarettenfilters, um einen flüssigen Zusatzstoff auf ein Band aus Filterfasern aufzutragen, die kontinuierlich entlang eines vorbestimmten Vorschubpfades (3) vorgeschoben werden, umfassend kontinuierliches Tropfen des flüssigen Zusatzstoffes aus einer Zuführeinheit (41), die an einer Stelle über und entfernt von den entlang des Vorschubpfades (3) vorgeschobenen Filterfasern eingerichtet ist, auf eine obere Fläche der darunter befindlichen Filterfasern derart, dass der flüssige Zusatzstoff kontinu-

ierlich ist,

wobei an einer an die Zuführeinheit (41) im Vorschubpfad (3) anschließenden Stufe eine Formeinheit bereitgestellt ist, die die Filterfasern in eine Stangenform formt, und der flüssige Zusatzstoff unmittelbar bevor die entlang des Vorschubpfades (3) vorgeschobenen Filterfasern an der Formeinheit angelangen auf die obere Fläche der Filterfasern getropft wird.

10. Herstellungsverfahren für den Zigarettenfilter nach Anspruch 9, wobei die Zuführeinheit (41) eine Auftragsdüse (48) einschließt, die aus einer unteren Fläche (41A) der Zuführeinheit (41) herausragt und eine Auftragsöffnung (48A) aufweist, um den flüssigen Zusatzstoff aufzutropfen.
11. Herstellungsverfahren für den Zigarettenfilter nach Anspruch 10, wobei eine Vielzahl der Auftragsdüsen (48) an der unteren Fläche (41A) der Zuführeinheit (41) in einer Linie eingerichtet sind.
12. Herstellungsverfahren für den Zigarettenfilter nach Anspruch 11, wobei die Vielzahl von Auftragsdüsen (48) in festen Intervallen angeordnet sind.
13. Herstellungsverfahren für den Zigarettenfilter nach Anspruch 11 oder 12, wobei die Vielzahl von Auftragsdüsen (48) entlang einer Breitenrichtung des Vorschubpfades (3) in einer geraden Linie angeordnet sind.
14. Herstellungsverfahren für den Zigarettenfilter nach einem der Ansprüche 11 bis 13, wobei die Zuführeinheit (41) derart gehalten wird, dass eine Richtung, in der die Vielzahl von Auftragsdüsen (48) angeordnet ist, mit dem Vorschubpfad (3) bildet, frei verändert werden kann.
15. Herstellungsverfahren für den Zigarettenfilter nach einem der Ansprüche 9 bis 14, wobei das Umschalten zwischen Auftrag des flüssigen Zusatzstoffes auf die Filterfasern und Unterbrechung des Auftrags durch Umschalten einer Stellung einer Verschlusseinheit (46), die den aus der Zuführeinheit (41) heruntertropfenden flüssigen Zusatzstoff aufnimmt, zwischen einer geschlossenen Stellung, die den aus der Zuführeinheit (41) heruntertropfenden flüssigen Zusatzstoff aufnimmt, und einer offenen Stellung erfolgt, die den aus der Zuführeinheit (41) heruntertropfenden flüssigen Zusatzstoff nicht aufnimmt.
16. Herstellungsverfahren für den Zigarettenfilter nach einem der Ansprüche 9 bis 15, wobei

der flüssige Zusatzstoff der Zuführeinheit (41) über Verbindungsverrohrung (43) zugeführt wird, die mit einer Speichereinheit verbunden ist, die den flüssigen Zusatzstoff speichert, und an die Speichereinheit Druckspeisungsmittel angeschlossen sind, und der in der Speichereinheit gespeicherte flüssige Zusatzstoff der Zuführeinheit (41) zugeführt wird, indem der flüssige Zusatzstoff von den Druckspeisungsmitteln unter Druck in die Verbindungsverrohrung (43) gespeist wird.

Revendications

1. Appareil de fabrication (1) pour un filtre de cigarette, comprenant :
 - un mécanisme d'acheminement qui achemine en continu une bande de fibres de filtre le long d'un trajet d'acheminement prédéterminé (3) ;
 - un dispositif d'application (40) qui applique un additif liquide sur les fibres de filtre acheminées le long du trajet d'acheminement (3) ; et
 - une unité de façonnage qui est fournie à une étape ultérieure au dispositif d'application (40) dans le trajet d'acheminement (3) et façonne les fibres de filtre en une forme de tige, dans lequel le dispositif d'application (40) inclut une unité d'alimentation (41) qui est agencée au-dessus et à distance des fibres de filtre acheminées le long du trajet d'acheminement (3) et fait tomber en continu l'additif liquide sur une surface supérieure des fibres de filtre située en dessous de sorte que l'additif liquide est continu, et l'unité d'alimentation (41) est agencée immédiatement en amont de l'unité de façonnage.
2. Appareil de fabrication pour le filtre de cigarette selon la revendication 1, dans lequel l'unité d'alimentation (41) inclut une buse d'application (48) qui fait saillie depuis une surface inférieure (41A) de l'unité d'alimentation (41) et présente un orifice d'application (48A) pour faire tomber l'additif liquide.
3. Appareil de fabrication pour le filtre de cigarette selon la revendication 2, dans lequel une pluralité des buses d'application (48) sont agencées en ligne sur la surface inférieure (41A) de l'unité d'alimentation (41).
4. Appareil de fabrication pour le filtre de cigarette selon la revendication 3, dans lequel la pluralité de buses d'application (48) sont disposées à intervalles fixes.
5. Appareil de fabrication pour le filtre de cigarette selon

la revendication 3 ou 4, dans lequel la pluralité de buses d'application (48) sont disposées en ligne droite le long d'une direction de largeur du trajet d'acheminement (3).

6. Appareil de fabrication pour le filtre de cigarette selon l'une quelconque des revendications 3 à 5, dans lequel le dispositif d'application (40) inclut en outre une unité de maintien (47) qui maintient l'unité d'alimentation (41), et l'unité de maintien (47) maintient l'unité d'alimentation (41) de sorte qu'un angle qu'une direction, dans laquelle la pluralité de buses d'application (48) sont disposées, forme avec le trajet d'acheminement (3) puisse être modifié librement.
7. Appareil de fabrication pour le filtre de cigarette selon l'une quelconque des revendications 1 à 6, dans lequel le dispositif d'application (40) inclut en outre une unité d'obturation (46) qui reçoit l'additif liquide tombant depuis l'unité d'alimentation (41) et une unité d'entraînement qui entraîne l'unité d'obturation (46), et une position de l'unité d'obturation (46) est modifiée par l'unité d'entraînement entre une position fermée qui reçoit l'additif liquide tombant depuis l'unité d'alimentation (41) et une position ouverte qui ne reçoit pas l'additif liquide tombant depuis l'unité d'alimentation (41).
8. Appareil de fabrication pour le filtre de cigarette selon l'une quelconque des revendications 1 à 7, dans lequel le dispositif d'application (40) inclut en outre une unité de stockage qui stocke l'additif liquide, un tuyau de raccordement (43) qui raccorde l'unité de stockage et l'unité d'alimentation (41), et un moyen d'acheminement sous pression qui est annexé à l'unité de stockage et achemine sous pression l'additif liquide stocké dans l'unité de stockage à la conduite (43).
9. Procédé de fabrication pour fabriquer un filtre de cigarette pour appliquer un additif liquide à une bande de fibres de filtre qui sont acheminées en continu le long d'un trajet d'acheminement prédéterminé (3), comprenant l'étape consistant à faire tomber en continu l'additif liquide depuis une unité d'alimentation (41) qui est agencée au niveau d'une position au-dessus et à distance des fibres de filtre acheminées le long du trajet d'acheminement (3) sur une surface supérieure des fibres de filtre située en dessous de sorte que l'additif liquide soit continu, dans lequel une unité de façonnage qui façonne les fibres de filtre en une forme de tige est fournie à une étape ultérieure à l'unité d'alimentation (41) dans le

- trajet d'acheminement (3), et
l'additif liquide est fait tomber sur la surface supérieure des fibres de filtre immédiatement avant que les fibres de filtre acheminées le long du trajet d'acheminement (3) n'arrivent au niveau de l'unité de façonnage. 5
10. Procédé de fabrication pour le filtre de cigarette selon la revendication 9, dans lequel l'unité d'alimentation (41) inclut une buse d'application (48) qui fait saillie depuis une surface inférieure (41A) de l'unité d'alimentation (41) et présente un orifice d'application (48A) pour faire tomber l'additif liquide. 10
11. Procédé de fabrication pour le filtre de cigarette selon la revendication 10, dans lequel une pluralité des buses d'application (48) sont agencées en ligne sur la surface inférieure (41A) de l'unité d'alimentation (41). 15 20
12. Procédé de fabrication pour le filtre de cigarette selon la revendication 11, dans lequel la pluralité de buses d'application (48) sont disposées à intervalles fixes. 25
13. Procédé de fabrication pour le filtre de cigarette selon la revendication 11 ou 12, dans lequel la pluralité de buses d'application (48) sont disposées en ligne droite le long d'une direction de largeur du trajet d'acheminement (3). 30
14. Procédé de fabrication pour le filtre de cigarette selon l'une quelconque des revendications 11 à 13, dans lequel l'unité d'alimentation (41) est maintenue de sorte qu'une direction, dans laquelle la pluralité de buses d'application (48) sont disposées, forme avec le trajet d'acheminement (3) puisse être modifiée librement. 35 40
15. Procédé de fabrication pour le filtre de cigarette selon l'une quelconque des revendications 9 à 14, dans lequel une commutation entre l'application de l'additif liquide sur les fibres de filtre et la suspension de l'application est effectuée en modifiant une position d'une unité d'obturation (46) qui reçoit l'additif liquide tombant depuis l'unité d'alimentation (41) entre une position fermée qui reçoit l'additif liquide tombant depuis l'unité d'alimentation (41) et une position ouverte qui ne reçoit pas l'additif liquide tombant depuis l'unité d'alimentation (41). 45 50
16. Procédé de fabrication pour le filtre de cigarette selon l'une quelconque des revendications 9 à 15, dans lequel l'additif liquide est fourni à l'unité d'alimentation (41) 55

par l'intermédiaire d'une conduite (43) qui est raccordé à une unité de stockage qui stocke l'additif liquide, et
un moyen d'acheminement sous pression est annexé à l'unité de stockage, et l'additif liquide stocké dans l'unité de stockage est fourni à l'unité d'alimentation (41) en acheminant sous pression l'additif liquide à la conduite (43) par le moyen d'acheminement sous pression.

FIG. 1

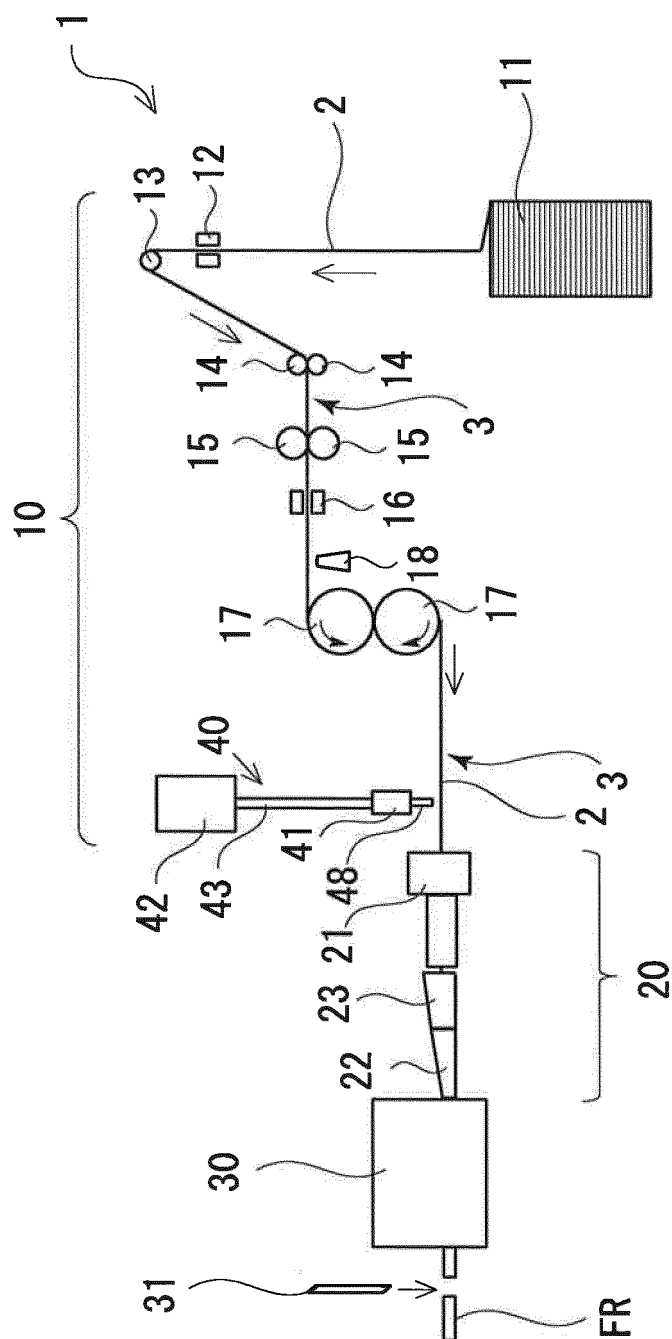


FIG. 2

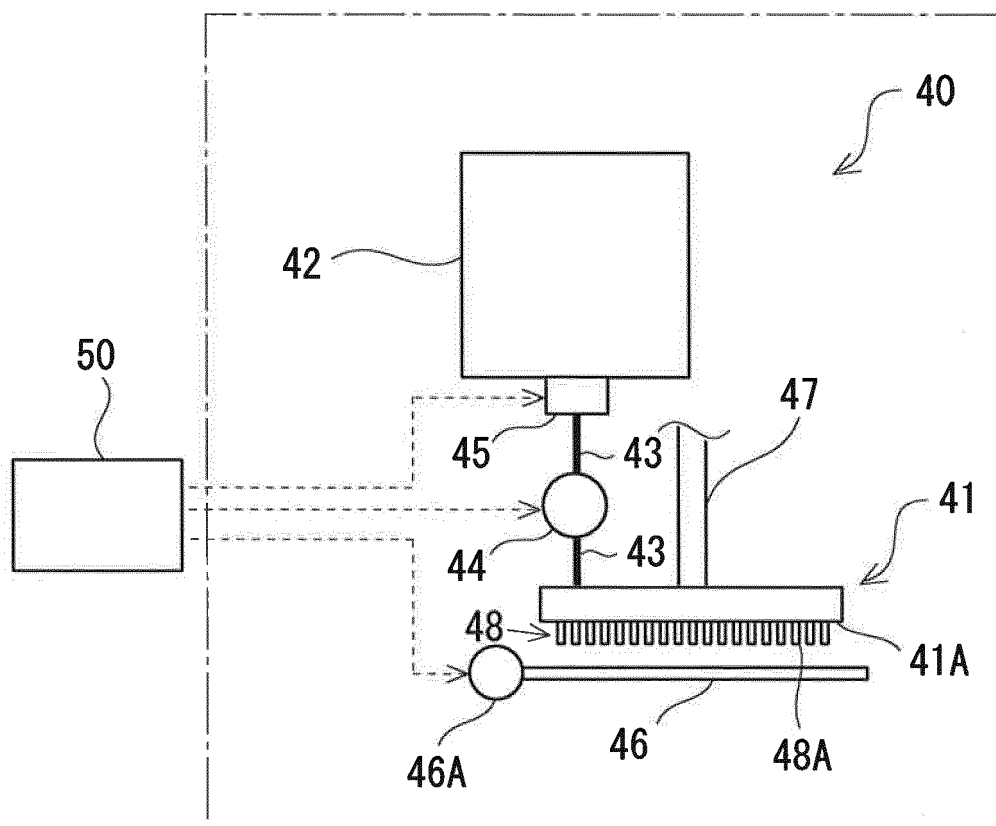


FIG. 3

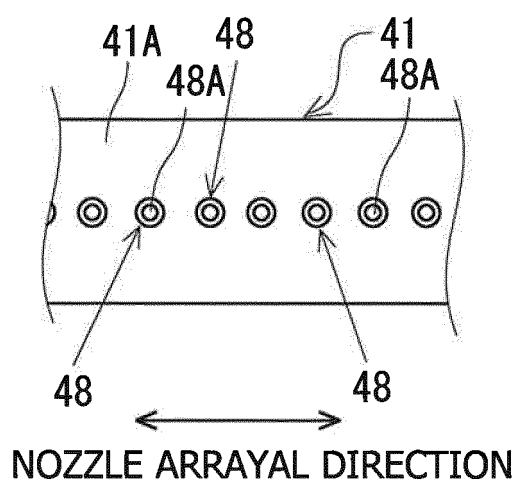


FIG. 4

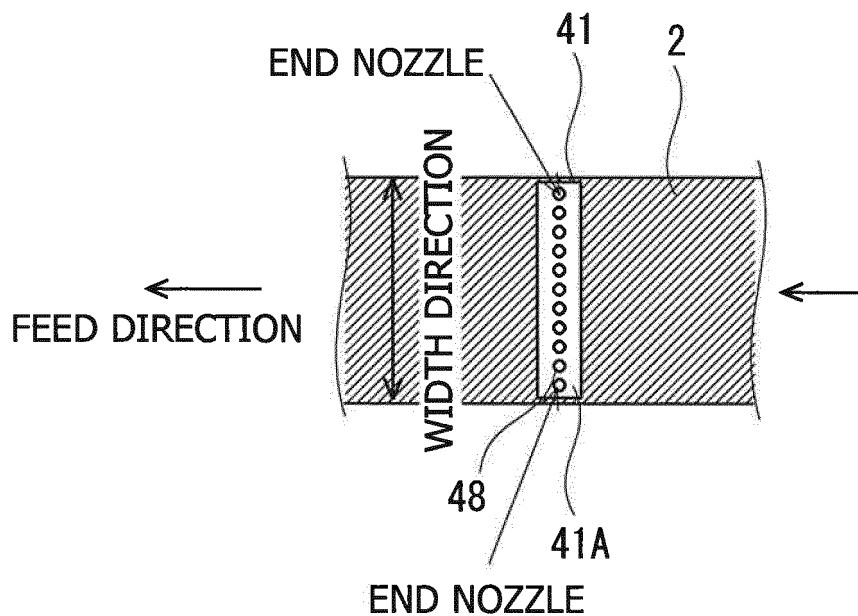


FIG. 5A

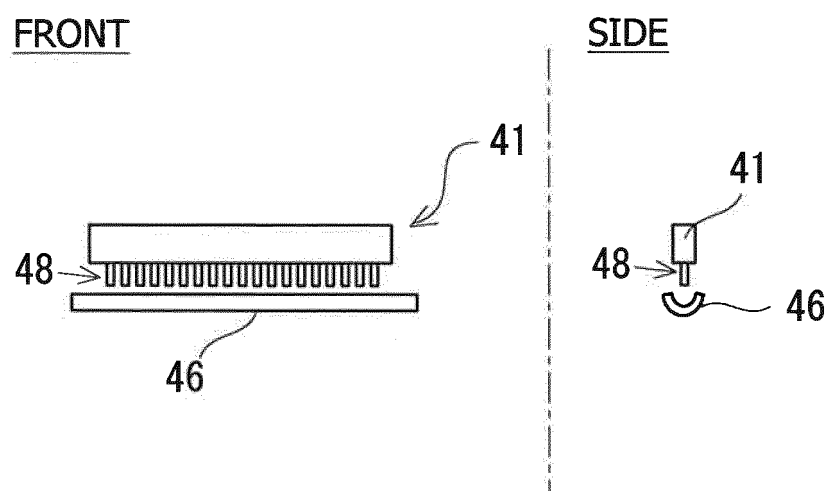


FIG. 5B

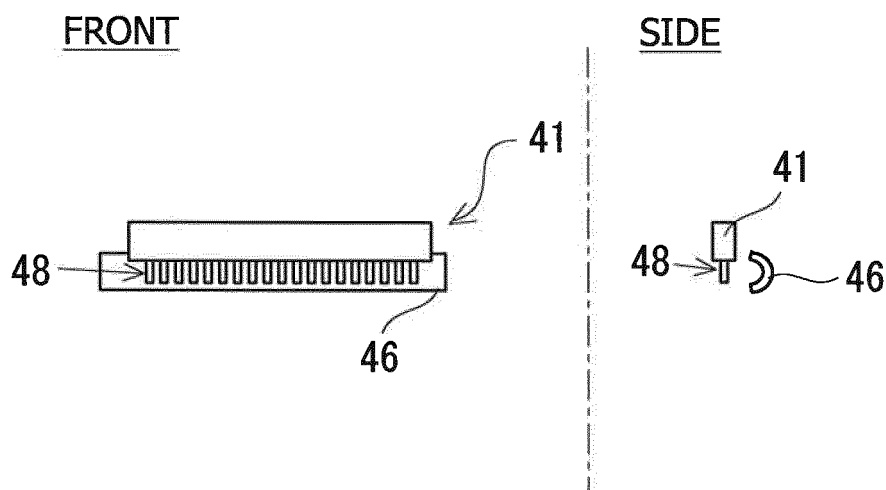


FIG. 6

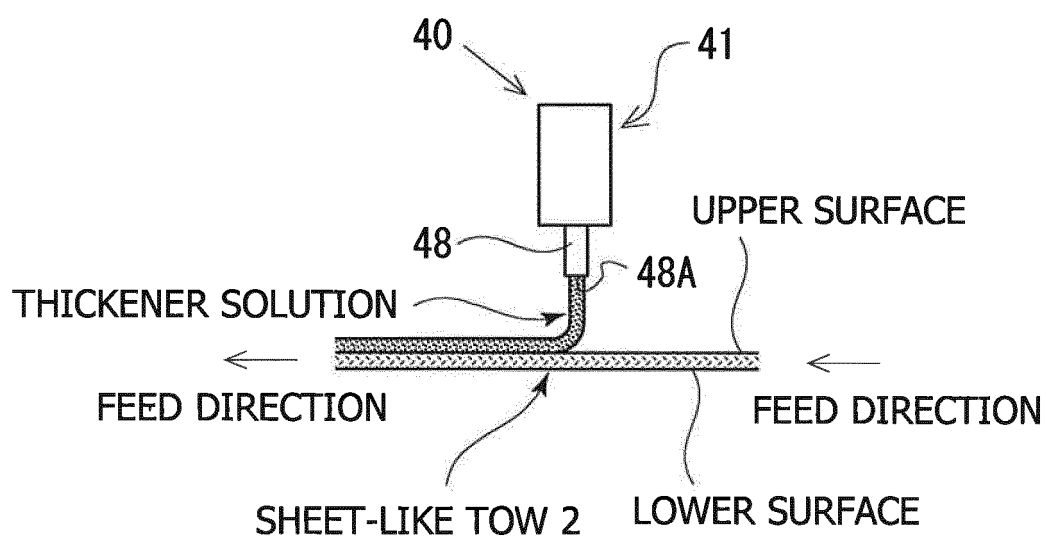


FIG. 7

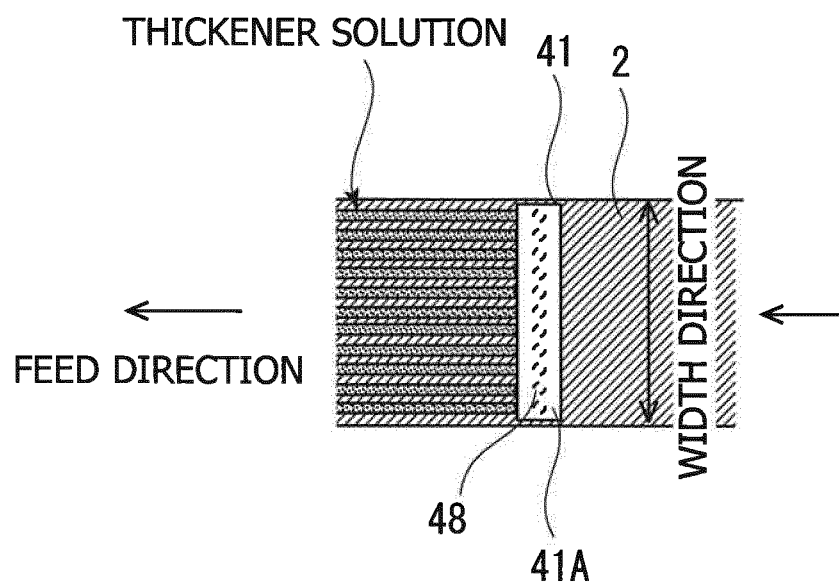


FIG. 8

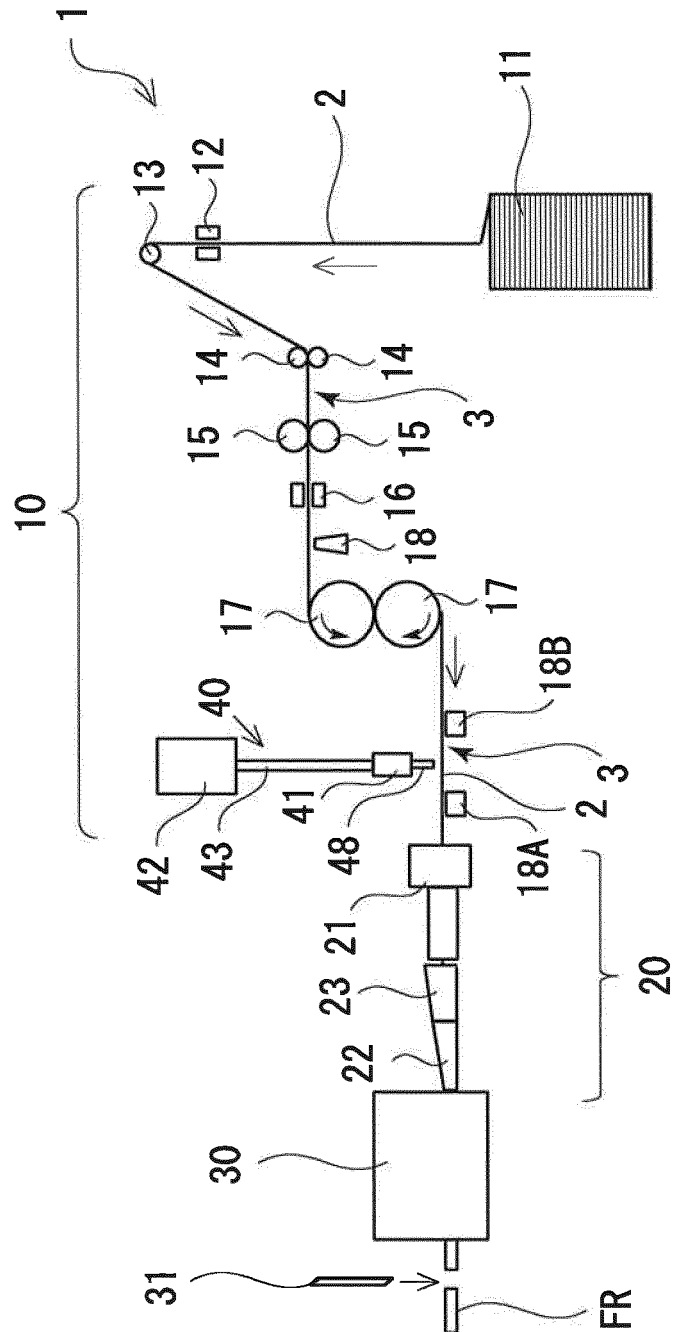


FIG. 9

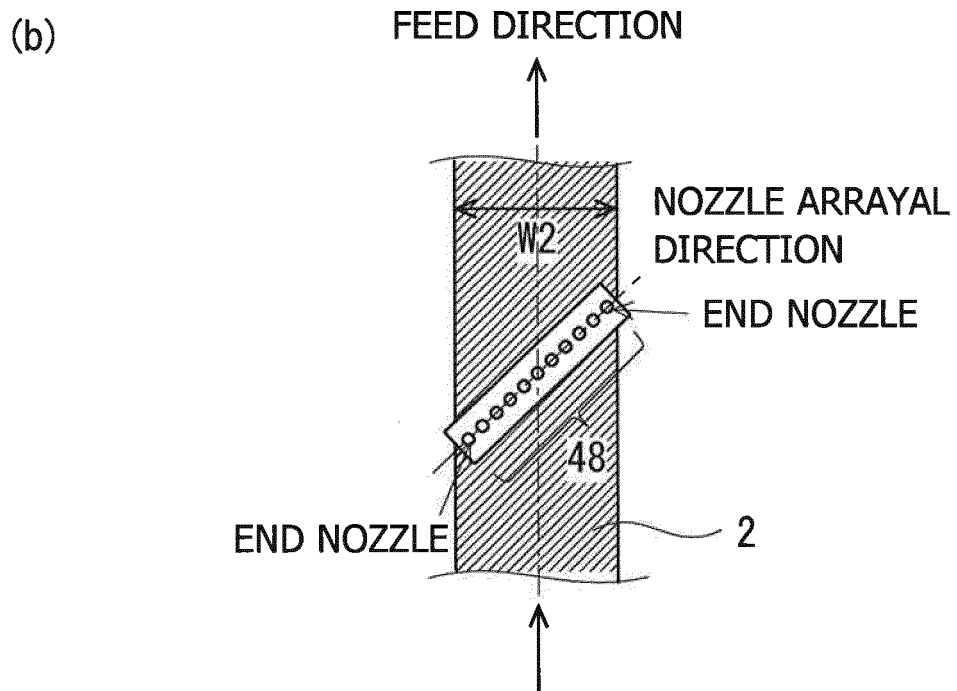
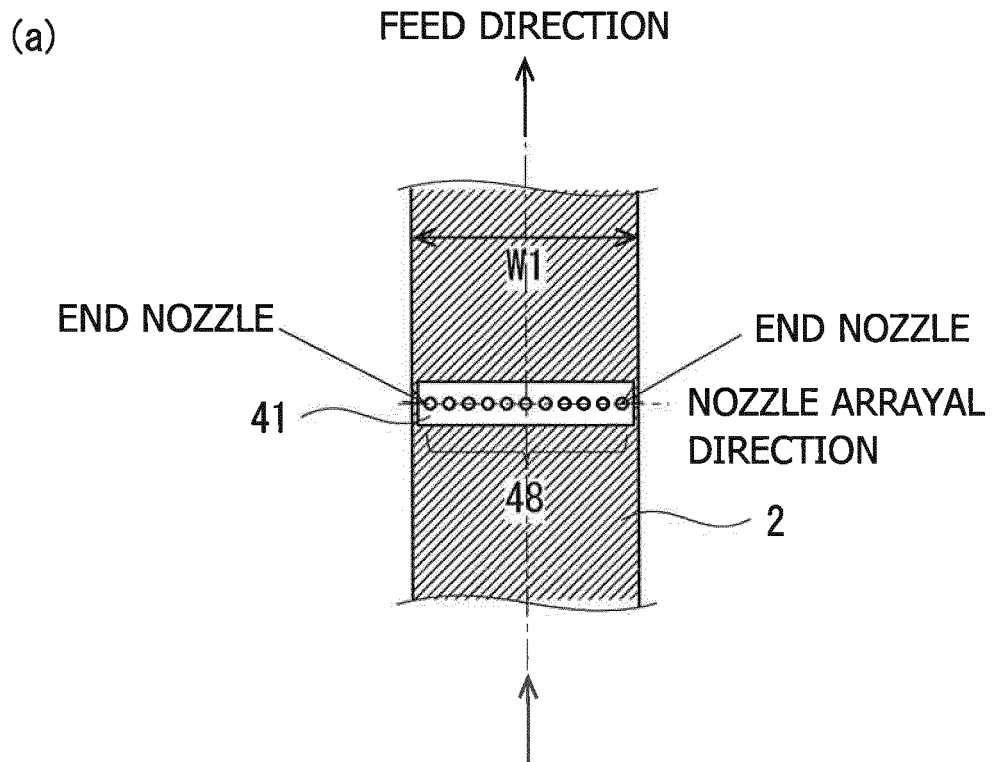


FIG. 10



FIG. 11

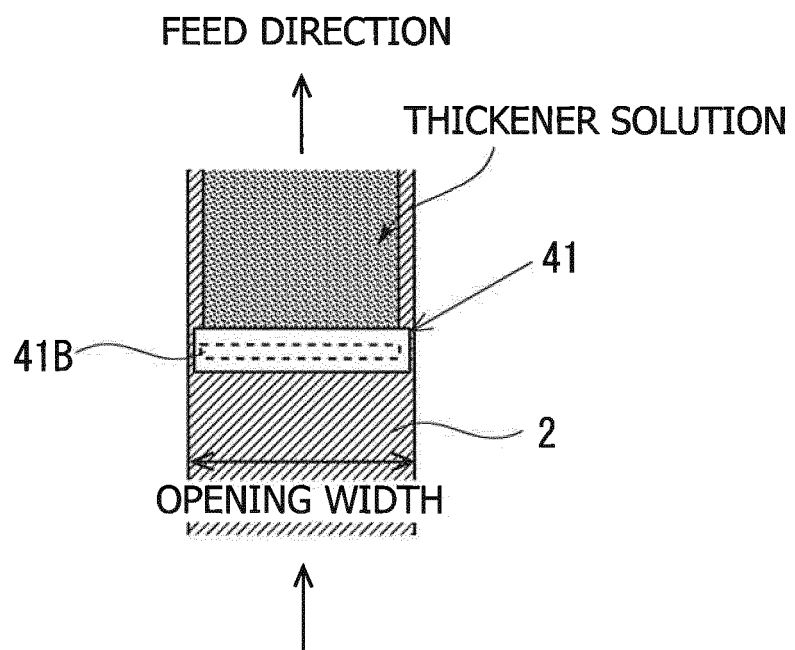


FIG. 12

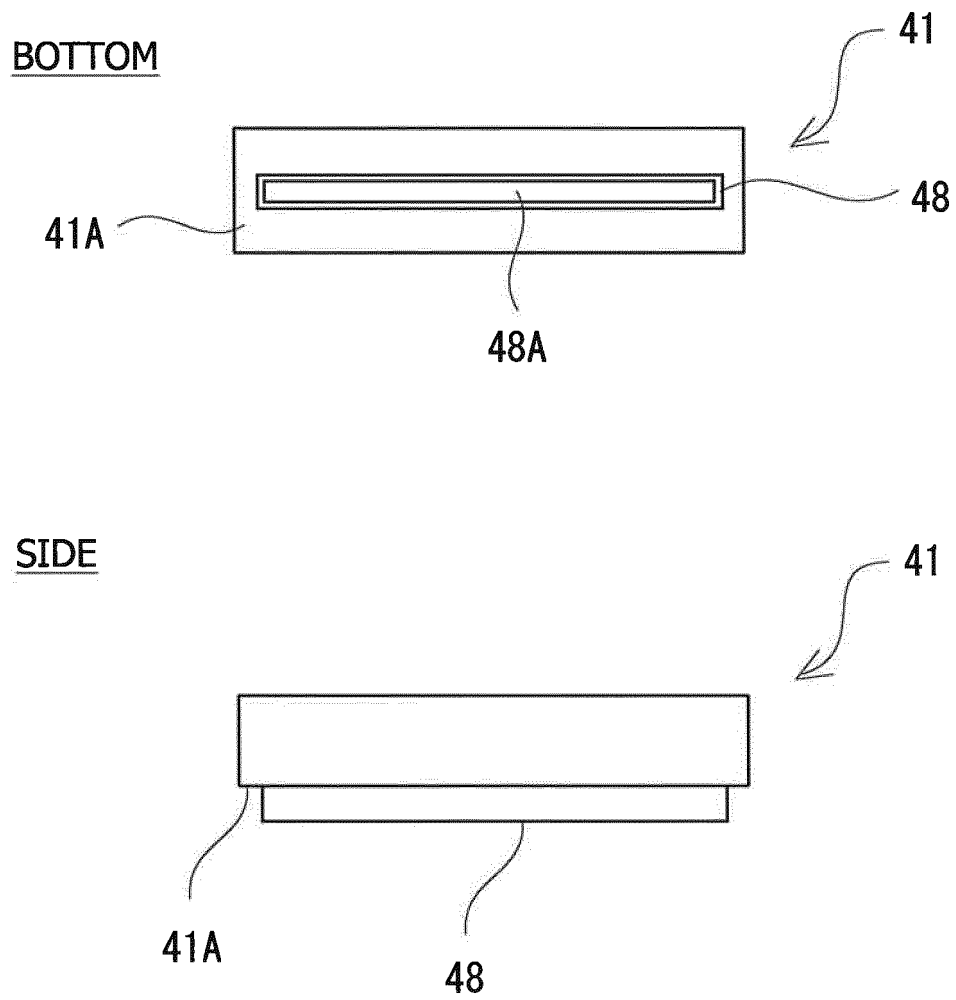
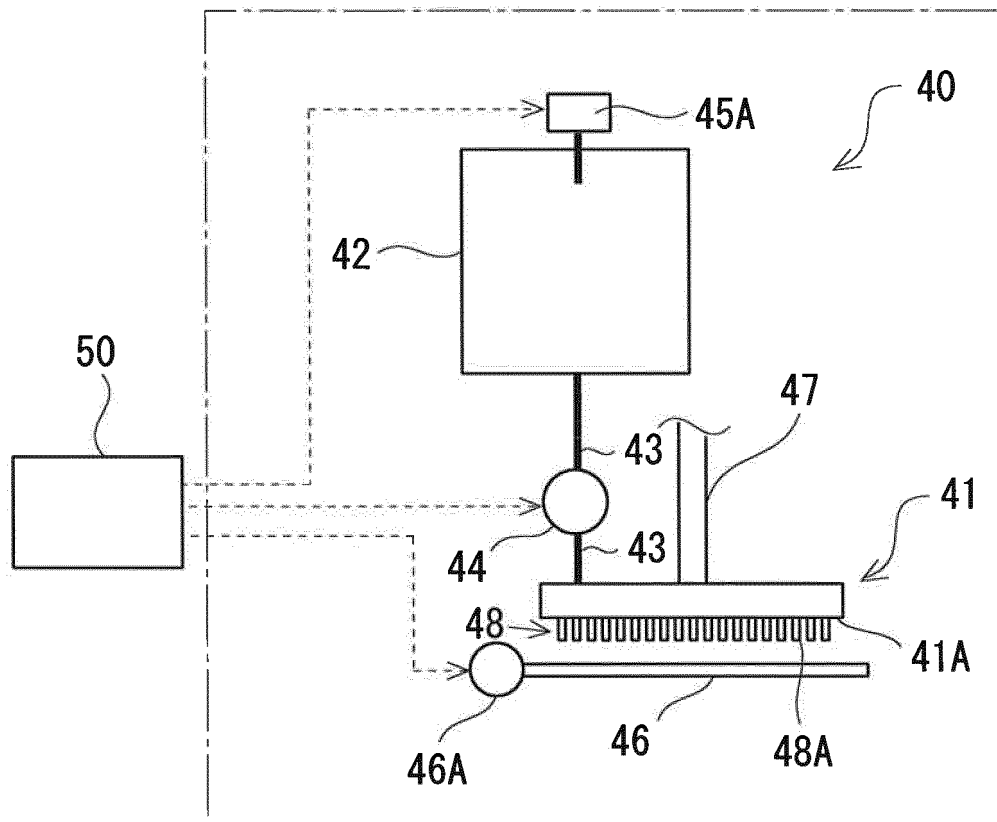


FIG. 13



REFERENCES CITED IN THE DESCRIPTION

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