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(54) **MANUFACTURE OF CELLULOSE ESTER FILAMENTS: LUBRICATION IN THE SPINNING CABINET**

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(58) **Field of Classification Search** ..... 264/130, 264/211.14, 187, 203, 178 F
See application file for complete search history.

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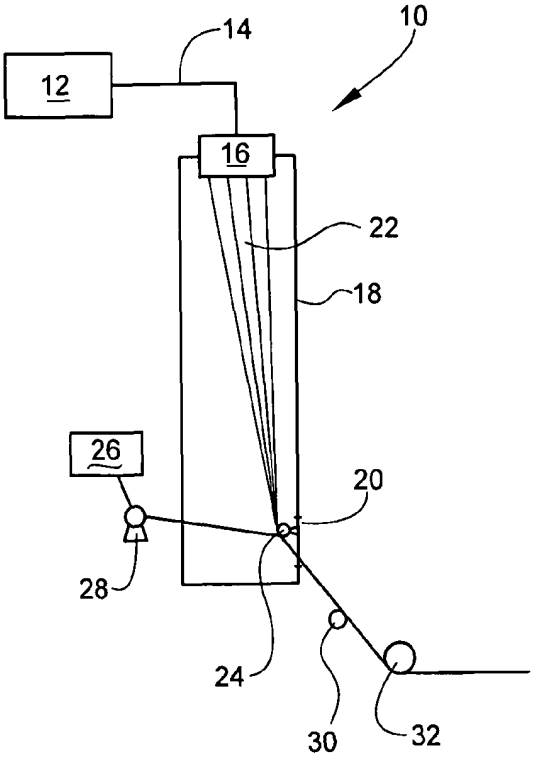
(57) **ABSTRACT**

In the manufacture of cellulose ester fibers, a dope is extruded into filaments. Extrusion occurs in an elongated cabinet having an outlet for the filaments. The filaments are taken up after exiting the outlet. The filaments are lubricated at the outlet of the cabinet.

6 Claims, 1 Drawing Sheet



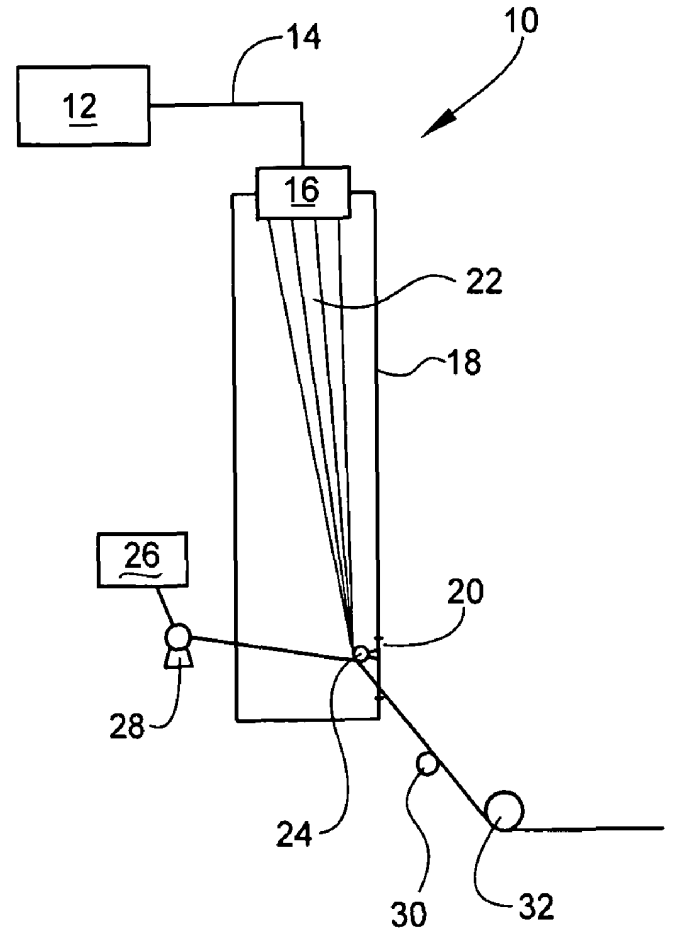


Fig. 1

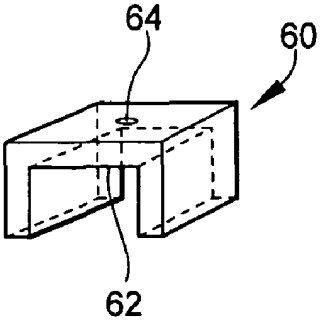


Fig. 2

MANUFACTURE OF CELLULOSE ESTER FILAMENTS: LUBRICATION IN THE SPINNING CABINET

FIELD OF THE INVENTION

The present invention is directed to the manufacture of cellulose ester filaments.

BACKGROUND OF THE INVENTION

Conventionally, in the manufacture of cellulose esters filaments, the filaments are not lubricated until after they leave the spinning cabinet. One reason for this practice is to avoid the contamination of the solvent used in the extrusion of the cellulose ester filaments with the lubricant.

Conventionally, in the manufacture of cellulose ester filaments, the cellulose ester polymer is dissolved into a solvent, that solution is known as dope. The dope is pumped to a die (or jet or spinneret) having a plurality of holes therethrough. The die is typically located at the upper end of a spinning cabinet. When the dope exits the die, the solvent flashes from the dope and the filaments begin to solidify. While the filaments travel downwardly through the cabinet, the solvent is captured within the cabinet for reuse. At the bottom of the cabinet, there is an outlet through which the filaments exit the cabinet. Typically, the filaments are guided from their downward (or vertical) travel to a generally horizontal direction (including angles below the horizontal) of travel at the outlet of the cabinet. The guide may be any conventional guide device, but it does not lubricate the filaments as their direction is changed. Thereafter, the filaments exit the cabinet. After exit, the filaments are lubricated by a lubricator, for example, a kiss roll. This lubricator is typically located about 6-12 inches (15-30 cm) from the exit of the cabinet. Then, the filaments are drawn away by a feed roll.

It is believed that the filaments are damaged as they pass over the non-lubricated guide. This damage causes variability in the filament.

There is a need to make a more uniform and more robust filament product.

Japanese Application No. 2003-020952 (Publication No. 2004-232124) discloses a method for manufacturing cellulose acetate tow where finish (oil) is metered on to filaments of the tow band at the point where the various thread lines from the cabinets are converged. The point of convergence is away from the cabinet exit.

U.S. Publication Nos. 2005/0202179 and 2005/0202993 disclose a finish for improving plug making that is applied, through existing fiber finish applicators, as the filaments exit the spinning cabinet. These publications do not mention the problem solved in the instant application.

SUMMARY OF THE INVENTION

In the manufacture of cellulose ester fibers, a dope is extruded into filaments. Extrusion occurs in an elongated cabinet having an outlet for the filaments. The filaments are taken up after exiting the outlet. The filaments are lubricated at the outlet of the cabinet.

DESCRIPTION OF THE DRAWINGS

For the purpose of illustrating the invention, there is shown in the drawings a form that is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. **1** is a schematic illustration of the present invention.

FIG. **2** is an isometric illustration of an embodiment of a lubricator.

DETAILED DESCRIPTION OF THE INVENTION

Cellulose ester filaments, as used herein, refers to, but is not limited to, cellulose acetates, cellulose propionates, cellulose butyrates, cellulose valerates, cellulose formates, and co-polymers thereof. Co-polymers include, but are not limited to, acetates-propionates or butyrates or valerates or formates and the like. Cellulose acetate refers to a cellulose acetate polymer having a typically degree of substitution between 2.1 and 2.7. For the following discussion of the invention, reference will be made to cellulose acetate, but the invention is not so limited.

Referring to FIG. **1**, there is shown a cellulose acetate spinning operation **10**. For simplicity, only one spinning operation **10** is shown, but the skilled person will understand that there may be a plurality of spinning operations joined together (e.g., a métier). A dope supply **12** is connected to a die **16**, via manifold **14**. Die **16** is located at the upper end of cabinet **18**. Cabinet **18** is an elongated enclosure that is used to capture the solvent (e.g., acetone when forming cellulose acetate filaments) for re-use. Cabinet **18** has an outlet **20** (typically a door or opening through the cabinet wall) through which filaments **22** exit the cabinet. A lubricant applicator **24** is located at the lowermost end of the cabinet. The placement of applicator **24** with relation to outlet **20** will be discussed in greater detail below. Applicator **24** is used to apply lubricant (discussed below) to the filaments and change the direction of travel of the filaments. After lubrication, the filaments exit the cabinet **18** via outlet **20**. Filaments **22** are drawn from the cabinet **18** by feed roll **32** (or take up roll). Between outlet **20** and feed roll **32**, there is a lubricator **30** which is conventional, e.g., a kiss roll. While spinning operation **10** is illustrated with filaments exiting on a side of cabinet **18**, spinning operation **10** may also be a 'pass through' spinning operation where filaments exit through the bottom end of the cabinet **18**.

The applicator **24** is located at the lowermost end of the cabinet and in the vicinity of outlet **20**. 'In the vicinity of outlet **20**' means from about six inches (15.25 cm) before to about six inches (15.25 cm) after the outlet **20**, and before the lubricator **30**. In one embodiment, applicator **24** is located within the cabinet before the outlet or at the outlet but in the cabinet.

Lubricant, discussed in greater detail below, is supplied to applicator **24** from a lubricant supply **26** via metering pump **28**. In one embodiment, pump **28** is a peristaltic pump.

Lubricant application rates are less than 40 cc/min (when the filaments number 80-620 filaments per cabinet) to avoid excess lubricant for subsequent processing of the tow. Preferably, the rate is less than 20 cc/min, and most preferably, the rate is 5-10 cc/min.

Lubricant may be selected from the group consisting of water, oil-in-water emulsions, and oils. Typically, oils are mineral oils, as is well known in the art. The oil-in-water emulsions are well known and may include emulsifiers, antistats, and the like.

The applicator **24** may be any type of applicator including cylindrical applicators, channel applicators, spray applicators, dip tank applicators, or brush applicators. In FIG. **2**, applicator **60** is a channel-type applicator. Applicator **60** may be an inverted U with a flat surface **62**. Flat surface **62** is the filament contact surface. Lubricant is introduced via inlet **64** and wets the filaments on surface **62**.

EXAMPLES

The foregoing invention is further illustrated in the following non-limiting examples.

The following examples illustrate the improvement in filament properties obtained by lubrication at the outlet of the cabinet. In each of the examples, the applicator **24** (referred to as the FCPL in the Table) is located at the inside of the outlet **20**. The FCPL applicator was a channel-type applicator (see FIG. **2**). 'Control-1' refers to the use of a non-rotating ceramic roll with a concave surface. "Control-2' refers to the use of a ceramic channel guide with a flat surface (see FIG. **2**). The 'kiss roll' refers to the conventional lubricator **30**. For lubricant, 'Nothing' means no lubricant; 'H2O' means water; and 'EMUL' means an oil-in-water emulsion. Improvement in filament properties is illustrated by the coeffiecent of variation for elongation at break (% Eb CV) and tensile factor ($TE^{1/2}$). All physical properties set forth in the table below are measured in a conventional manner.

TABLE

	FCPL	Kiss Roll	Tenacity (g/denier)	Elongation at Break (Eb %)	% Eb CV	TE½
Control-1	Nothing	EMUL	1.03	22.13	7.50	4.83
Control-2	Nothing	EMUL	1.03	21.40	4.63	4.79
Invention	H20	EMUL	1.07	22.69	5.60	5.09
Invention	EMUL	EMUL	1.05	22.22	5.09	4.95
Invention	EMUL	Nothing	1.02	21.06	6.70	4.70
Control-1	Nothing	EMUL	1.12	17.57	13.49	4.72
Control-2	Nothing	EMUL	1.13	18.15	11.02	4.82
Invention	H2O	EMUL	1.27	21.86	2.15	5.92
Invention	EMUL	EMUL	1.26	22.95	4.97	6.04
Invention	EMUL	Nothing	1.22	22.17	3.88	5.75
Control-1	Nothing	EMUL	1.06	16.64	21.54	4.37
Control-2	Nothing	EMUL	1.10	17.88	18.35	4.69
Invention	H2O	EMUL	0.75	24.31	7.08	3.70

TABLE-continued

	FCPL	Kiss Roll	Tenacity (g/denier)	Elongation at Break (Eb %)	% Eb CV	TE½
Invention	EMUL	EMUL	1.05	21.17	3.35	4.84
Invention	EMUL	Nothing	1.03	21.59	5.05	4.77
Control-2	Nothing	EMUL	1.11	15.28	16.36	4.35
Invention	H20	EMUL	1.15	19.17	5.53	5.02

The present invention may be embodied in other forms without departing from the spirit and the essential attributes thereof, and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification, as indicated the scope of the invention.

We claim:

1. In the manufacture of cellulose ester filaments by extruding a dope, at an upper end and within an elongated cabinet having an outlet at a lower end, into a plurality of filaments, and taking up the filaments outside the cabinet, wherein the improvement comprises the step of:

lubricating the filaments, with an applicator located within the cabinet and adjacent the outlet, with a lubricant.

2. The process of claim **1** wherein lubricating further comprises metering the lubricant to the filaments.

3. The process of claim **2** wherein the lubricant is metered at a rate of less than 40 cc/min.

4. The process of claim **3** wherein the rate being between 5-10 cc/min.

5. The process of claim **1** wherein the lubricant being selected from the group consisting of water, oil-in-water emulsion, and oils.

6. The process of claim **5** wherein the lubricant being water.

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