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2789/P.

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO DIVISION DE NUEVAS CREACIONES

E. S. D.

SUPERINDUSTRIA Y COMERCIO

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Solicitud de Patente a nombre de
McNeil-PPC, Inc.

Trámite: 002 PATENTES D 1 REGISTRO/ 323 COMPLETEN
Dependencia: 2000 DIVISION DE NUEVAS CREACIONES

Yo, JIMENA ESCOBAR URIBE, identificada como aparece al pie de mi firma, domiciliada en la Carrera 11 A No. 94-76, of. 305, obrando como apoderada de la sociedad McNeil-PPC, Inc., domiciliada en Skillman, New Jersey, Estados Unidos de América, solicitante de la patente de la referencia, atentamente me permito presentar copia certificada de la solicitud de patente número 60/542,521 presentada en Estados Unidos de América el día 5 de febrero de 2004, con la debida traducción de lo pertinente.

Señor Superintendente,


JIMENA ESCOBAR URIBE
C.C.39.779.452 de Usaquén
T.P. 68228
Cód. 5376

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**ESTADOS UNIDOS DE AMERICA
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**DEPARTAMENTO DE COMERCIO DE LOS ESTADOS
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Enero 25 de 2005

La presente es para certificar que el anexo es una copia fiel de los registros de la Oficina de Patentes y Marcas de los Estados Unidos, de los documentos de la solicitud de patente identificada más adelante, que cumplieron con los requerimientos para concederse una fecha de presentación de acuerdo con 35 USC 111.

Número de Solicitud: 60/542,521

Fecha de Presentación: Febrero 5 de 2004

**Por la autoridad del
Comisionado de Patentes y Marca**

**(fdo) H.L. Jackson
Oficial Certificador
Sello oficial de la Oficina de Patentes y Marcas de los
Estados Unidos de América**

NOVEDAD DE LA INVENCION

REIVINDICACIONES

- 5 1.- Un método para aplicar una mezcla de adhesivo/superabsorbente a un sustrato, que comprende los pasos de: calentar una mezcla de adhesivo y polímero superabsorbente a una primera temperatura, a una primera presión, la primera temperatura es menor a la temperatura de ebullición de la mezcla a la primera presión; pasar la mezcla
- 10 calentada a través de un intercambiador de calor a una segunda presión, la segunda presión es mayor a la primera presión, el intercambiador de calor está adaptado para elevar la temperatura de la mezcla a una segunda temperatura que es mayor a dicha primera temperatura; y aplicar de manera selectiva la mezcla a un sustrato.
- 15 2.- El método de conformidad con la reivindicación 1, caracterizado además porque dicha primera presión es sustancialmente igual a presión ambiental.
- 3.- El método de conformidad con la reivindicación 1, caracterizado además porque dicha mezcla se aplica a dicho sustrato
- 20 mediante un aplicador de adhesivo.
- 4.- El método de conformidad con la reivindicación 3, caracterizado además porque dicho aplicador de adhesivo es un revestidor por ranuras.

5.- El método de conformidad con la reivindicación 1, caracterizado además porque dicho sustrato se mueve a una velocidad en la escala de 152.4 - 304.8 m/min.

6.- El método de conformidad con la reivindicación 3, caracterizado además porque dicha mezcla se calienta en un tanque de calentamiento.

7.- El método de conformidad con la reivindicación 6, caracterizado además porque comprende adicionalmente: transportar dicha mezcla a través de una primera longitud de conducto dispuesto entre dicho tanque de calentamiento y dicho intercambiador de calor; y transportar dicha mezcla a través de una segunda longitud de conducto dispuesto entre dicho intercambiador de calor y dicho aplicador de adhesivo.

8.- El método de conformidad con la reivindicación 7, caracterizado además porque comprende adicionalmente: calentar dicha primera longitud de conducto para mantener una temperatura de dicha mezcla dentro de dicha primera longitud de conducto sustancialmente constante.

9.- El método de conformidad con la reivindicación 7, caracterizado además porque comprende adicionalmente: calentar dicha segunda longitud de conducto para mantener una temperatura de dicha mezcla dentro de dicha segunda longitud de conducto sustancialmente constante.

10.- El método de conformidad con la reivindicación 1, caracterizado además porque dicha primera temperatura está en la escala de aproximadamente 93.3°C a aproximadamente 121°C.

11.- El método de conformidad con la reivindicación 1, caracterizado además porque dicha segunda temperatura está en la escala de aproximadamente 121°C a aproximadamente 177°C.

12.- El método de conformidad con la reivindicación 1, caracterizado además porque dicha primera temperatura es de aproximadamente 121°C y dicha segunda temperatura es de aproximadamente 149°C.

13.- El método de conformidad con la reivindicación 1, caracterizado además porque dicho adhesivo se aplica a una velocidad de aproximadamente 45 gsm a aproximadamente 80 gsm.

14.- El método de conformidad con la reivindicación 1, caracterizado además porque dicho sustrato es un sustrato no tejido.

15.- El método de conformidad con la reivindicación 1, caracterizado además porque dicha segunda presión está en la escala de aproximadamente 3.51 kg/cm² a aproximadamente 35.15 kg/cm².

16.- Un sistema para aplicar una mezcla de adhesivo/superabsorbente a un sustrato, que comprende: un tanque de calentamiento para calentar una mezcla de adhesivo y polímero superabsorbente a una primera temperatura, a una primera presión, la primera temperatura es menor que la temperatura de ebullición de la mezcla en la

primera presión; un intercambiador de calor en comunicación de flujo con el tanque de calentamiento para calentar la mezcla a una segunda presión, la segunda presión es mayor a la primera presión, el intercambiador de calor está adaptado para elevar la temperatura de la mezcla a una segunda
5 temperatura que es mayor a dicha primera temperatura; y un aplicador de adhesivo en comunicación de flujo con el intercambiador de calor para aplicar de manera selectiva la mezcla a un sustrato.

17.- El sistema de conformidad con la reivindicación 16, caracterizado además porque dicha primera presión es sustancialmente igual
10 a presión ambiental.

18.- El sistema de conformidad con la reivindicación 16, caracterizado además porque dicho aplicador de adhesivo es un revestidor por ranuras.

19.- El sistema de conformidad con la reivindicación 16, caracterizado además porque dicho sustrato es un sustrato móvil que se
15 mueve a una velocidad en la escala de 152.4 - 304.8 m/min.

20.- El sistema de conformidad con la reivindicación 16, caracterizado además porque comprende adicionalmente: una primera longitud de conducto dispuesto entre y que conecta dicho tanque de
20 calentamiento y dicho intercambiador de calor; y una segunda longitud de conducto dispuesto entre y que conecta dicho intercambiador de calor y dicho aplicador de adhesivo.

21.- El sistema de conformidad con la reivindicación 20, caracterizado además porque comprende adicionalmente al menos un calentador estructurado y dispuesto para calentar dicha primera longitud de conducto y mantener una temperatura de dicha mezcla dentro de dicha primera longitud de conducto sustancialmente constante.

22.- El sistema de conformidad con la reivindicación 20, caracterizado además porque comprende adicionalmente al menos un calentador estructurado y dispuesto para calentar dicha segunda longitud de conducto y mantener una temperatura de dicha mezcla dentro de dicha segunda longitud de conducto sustancialmente constante.

23.- El sistema de conformidad con la reivindicación 16, caracterizado además porque dicha primera temperatura está en la escala de aproximadamente 93.3°C a aproximadamente 121°C.

24.- El sistema de conformidad con la reivindicación 16, caracterizado además porque dicha segunda temperatura está en la escala de aproximadamente 121°C a aproximadamente 177°C.

25.- El sistema de conformidad con la reivindicación 16, caracterizado además porque dicha primera temperatura es de aproximadamente 121°C y dicha segunda temperatura es de aproximadamente 149°C.

26.- El sistema de conformidad con la reivindicación 16, caracterizado además porque dicho aplicador de adhesivo está estructurado y

dispuesto para aplicar dicho adhesivo a dicho substrato a una velocidad de aproximadamente 45 gsm a aproximadamente 80 gsm.

27.- El sistema de conformidad con la reivindicación 16, caracterizado además porque dicha segunda presión está en la escala de 5 aproximadamente 3.51 kg/cm^2 a aproximadamente 35.15 kg/cm^2 .

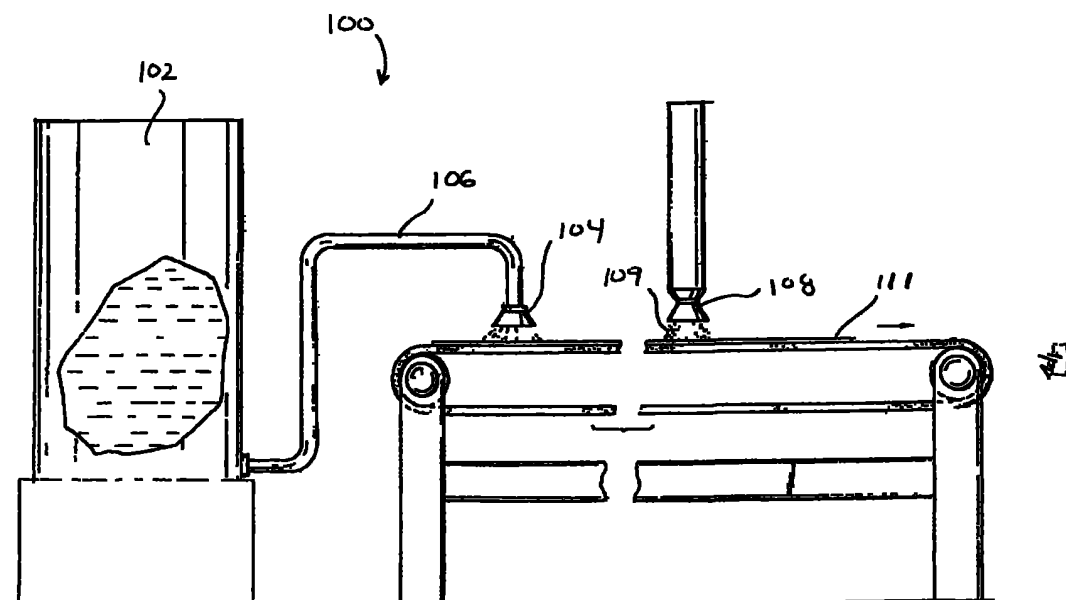


FIG. 1

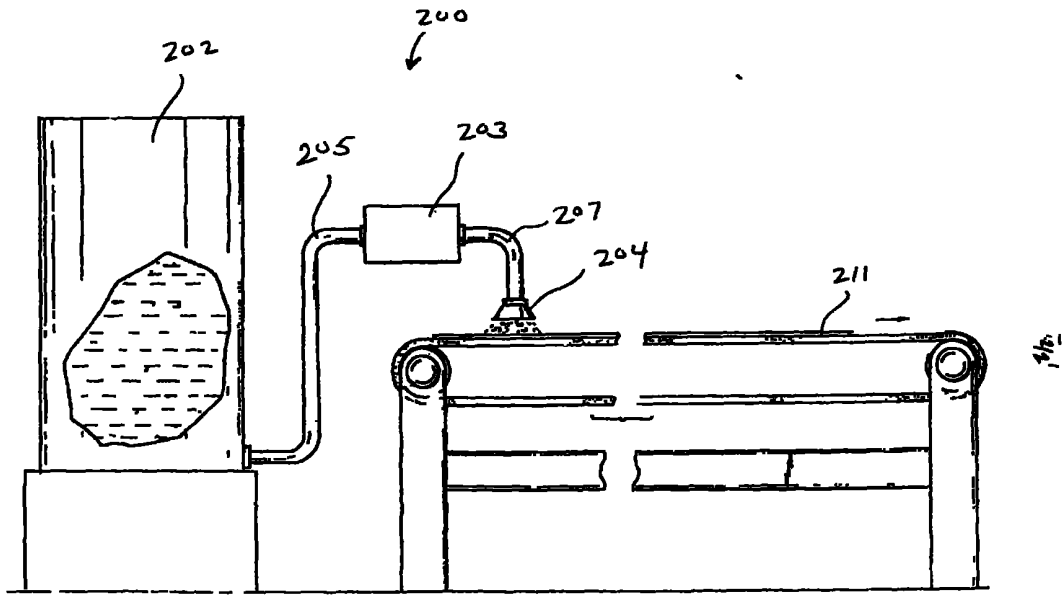


FIG. 2

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PA 1277006

THE UNITED STATES OF AMERICA

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UNITED STATES DEPARTMENT OF COMMERCE

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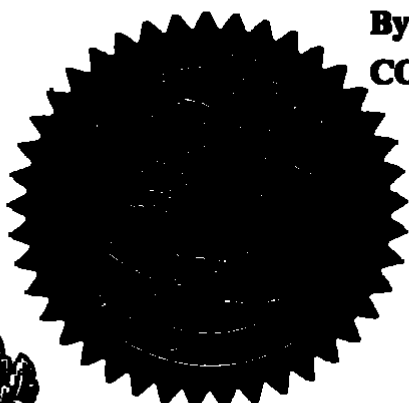
January 28, 2005

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 60/542,521

FILING DATE: *February 05, 2004*

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS



H. L. JACKSON
Certifying Officer

PROVISIONAL APPLICATION COVER SHEET

Mail Stop Provisional Patent Application
Commissioner for Patents
P.O. Box 1480
Alexandria, VA 22313-1480

22154 U.S. PTO
60/542521
020504

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53 (c).

			DOCKET NUMBER	PPC-8043-PSP
INVENTOR(s) / APPLICANT(s)				
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METHOD AND SYSTEM FOR APPLYING ABSORBENT MATERIAL TO A SUBSTRATE				
CORRESPONDENCE ADDRESS				
Direct all correspondence to: ☒ Customer Number 080027777 OR ☐ Firm or Individual Name:				
ENCLOSED APPLICATION PARTS (check all that apply)				
☒ Specification	Number of Pages	21	☐ Application Data Sheet	
☒ Claims	Number of Claims	22	☐ CD(s), Number	
☒ Drawing(s)	Number of Sheets	2	☐ Other (specify)	
METHOD OF PAYMENT (check one)				
☐ A check or money order is enclosed to cover the Provisional filing fees.			Provisional Filing Fee Amount (\$)	\$ 160.00
☒ The Commissioner is hereby authorized to charge filing fees and credit any overpayment to Deposit Account No. 10-0750/PPC-8043-PSP/PJH				

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No

☐ Yes, the name of the U.S. Government agency and the Government contract number are:

Respectfully submitted,

SIGNATURE:

REGISTRATION NO. 44,152

TYPED or PRINTED NAME PAUL J. HIGGINS

DATE: February 6, 2004

TELEPHONE (732) 824-1728

PROVISIONAL APPLICATION FILING ONLY

7-5
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DOCKET NO. PPC-5043-PSP

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Paul Fung et al.

For : METHOD AND SYSTEM FOR APPLYING ABSORBENT MATERIAL
TO A SUBSTRATE

Express Mail Certificate

"Express Mail" mailing number: EV 313408692 US

Date of Deposit: February 6, 2004

I hereby certify that this complete application, including specification pages, claims, and informal drawings is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

KRISTINE KINGSBURY

(Typed or printed name of person mailing paper or fee)



(Signature of person mailing paper or fee)

Serial No. _____ Docket No. PP 5043 P&P by PSH
 Application of Fung et al Filed: February 6, 2004
 Entitled: Method and System for Analyzing Fluorescent Material to Estimate
 THE FOLLOWING HAS BEEN RECEIVED IN THE U.S. PATENT OFFICE ON THE DATE STAMPED HEREON:
☒ Provisional ☐ Nonprovisional ☐ CPA ☐ RCE ☐ CIP ☐ Divisional ☐ Design ☐ PCT
☐ Continuation ☐ Other _____
☐ Oath or Declaration
☐ Assignment
☒ Charge to Deposit Account 10-0780
☐ Priority Document
☐ Data Sheet
☐ IDS-Form 1449
☐ Extension of Time
☐ PTO 1380 (PCT)
 Express-Mail Certificate
☒ EV 313 408 698 US
☒ Specification 21 pgs
☒ Claims 27
☒ Drawings 2 sheets
☐ Preliminary Amendment
☐ Sequence Listings/Drawings
☐ Biological Deposit Declaration
☐ Other _____

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METHOD AND SYSTEM FOR APPLYING ABSORBENT MATERIAL TO A SUBSTRATE

5 Field of the Invention

The present invention relates to a method and system for selectively applying an absorbent material to the surface of a substrate, and in particular, a method and system for applying a super absorbent polymer (SAP) and adhesive mixture to a substrate.

Background of the Invention

Absorbent articles such as, for example, disposable diapers, sanitary napkins, pantliners, etc., are well known in the art. Known absorbent articles may typically include, for example, a fluid permeable coverstock, a fluid impermeable back sheet and an absorbent core supported therebetween. Traditionally, absorbent cores include loosely
15 formed cellulosic fibers and may also contain superabsorbent polymer fibers to improve the absorbent capacity of the core. The term "superabsorbent polymer" (or "SAP") as used herein, generally refers to materials which are capable of absorbing and retaining at least about 10 times their weight in body fluids under a 0.5 psi pressure. Such superabsorbent polymers include crosslinked hydrophilic polymers, such as polyvinyl
20 alcohols, polyethylene oxides, crosslinked starches, guar gum, xanthan gum, and the like. One commercially available SAP material is AQUAKEEP SA-70, available from Sumitomo Seika Chemicals Co., Ltd.

Due to the loosely formed nature of traditional cores, such cores are rather thick and bulky in nature. More recently, in an effort to reduce the overall thickness and
25 bulkiness of absorbent articles, particularly in feminine pads, sanitary napkins, pantliners

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and the like, the traditional loosely formed absorbent core, has been replaced with a thin highly absorbent web material which frequently includes, in part, a SAP particulate material. As discussed in further detail below, the highly absorbent web material is typically formed by either incorporating the SAP particulate in the web during the web forming process, or in the alternative, the SAP particulate may be mechanically applied (using nozzles or the like) to the web after the web forming process.

A SAP particulate material may be incorporated into a web directly during the web forming process using any one of a number of known non-woven web forming techniques (e.g. air laid). During these processes, the SAP particulate material is incorporated into the web material by mixing SAP particulate material with the other fibrous components of the web prior to the formation of the web. The other fibrous components of the web may include cellulosic fibers such as wood pulp fibers, cotton linters, rayon fibers, flax, jute and the like. Hydrophilic synthetic fibers, such as polyethylene, polypropylene, nylon, polyester and the like, may be used in lieu of or in combination with cellulosic fibers.

As discussed above, the SAP particulate material may alternatively be applied to a web substrate after the web has been formed. Typically the SAP particulate is applied to the web by using mechanical delivery devices such as conduits, nozzle sprayers, and the like to thereby apply the SAP particulate material to the web. A method and system for the application of SAP particulate material to a web in this manner is described in U.S. Patent No. 5,248,524. Optionally, an adhesive may be applied to the substrate prior to the application of the SAP material so that the superabsorbent adheres to the substrate in those areas where the adhesive has been applied. Slot coaters, such as the commercially

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available Nordson EP-11 and the Nordson EP-45, from Nordson, and spray style applicators may be used to apply the adhesive to the web substrate.

Unfortunately, both of the prior art techniques described above have inherent drawbacks. For example, mixing the SAP material and the fibrous components of the web prior to the formation of the web normally results in the SAP material being uniformly dispersed through the web. In some applications, this may not be desired. For example, in some applications, it may be preferable to selectively apply the SAP material only to a portion of the substrate or it may be desirable to apply the SAP material to the substrate in a selected pattern. Further, depending on the particular fibrous material(s) that forms the web, it may not be desirable to mix the SAP material with the fibrous material prior to the formation of the web, since the materials may not be mutually compatible. Likewise, using conduits, nozzles, and the like to deliver the SAP material to a formed web substrate, particularly a substrate moving at a high speed, is also subject to variety of problems. For example, it is difficult to apply the SAP material to a pre-determined, localized area of the substrate. In particular, if the spraying of the SAP material is not initiated and terminated within a tightly defined time interval, the SAP particulate may be delivered to undesired locations rather than the desired location on the substrate. Furthermore, the SAP particulate material is often subject to spreading, *i.e.*, the particulate does not remain localized on the substrate and the particulate may migrate to locations where it is not desired, thereby contaminating the process. The above problems are compounded for non-woven substrates which are often processed at line speeds that are fast enough to promote scattering of the SAP particulate to undesired locations on the substrate.

In view of the above, a need exists for a method of applying a superabsorbent material to a substrate that overcomes one or more of the above-mentioned drawbacks.

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54**Summary of the Invention**

According to a first aspect of the invention, the present invention provides a method for applying an adhesive/superabsorbent mixture to a substrate including the steps of:

5 heating an adhesive and superabsorbent polymer mixture to a first temperature at a first pressure, the first temperature being less than the boiling temperature of the mixture at the first pressure;

passing the heated mixture through a heat exchanger at a second pressure, the second pressure being higher than the first pressure, the heat exchanger being adapted to
10 raise the temperature of the mixture to a second temperature that is higher than said first temperature; and

selectively applying the mixture to a substrate.

According to a second aspect of the invention, the present invention provides a system for applying an adhesive/superabsorbent mixture to a substrate including:

15 a heating tank for heating an adhesive and superabsorbent polymer mixture to a first temperature at a first pressure, the first temperature being less than the boiling temperature of the mixture at the first pressure;

a heat exchanger in flow communication with the heating tank for heating the mixture at a second pressure, the second pressure being higher than the first pressure, the
20 heat exchanger being adapted to raise the temperature of the mixture to a second temperature that is higher than the first temperature; and

an adhesive applicator in flow communication with the heat exchanger for selectively applying the mixture to a substrate.

Brief Description of the Drawings

A more detailed description of the invention is provided below, with reference to the appended drawings in which:

Fig. 1 is a schematic view of a prior art system for applying an adhesive and
5 superabsorbent particulate material to a substrate; and

Fig. 2 is a schematic view of the system according to the present invention for applying superabsorbent/adhesive mixture to a substrate.

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Detailed Description of the Invention

As discussed briefly in the "Background of the Invention" section above, one of the known techniques for adhering superabsorbent polymer, in particulate or fibrous form, to a substrate includes the steps of coating a surface of the substrate with an adhesive and applying superabsorbent material to the coated substrate using mechanical delivery devices such as conduits, nozzle sprayers. In this manner the SAP adheres to the web. A process of this type generally includes the following steps:

- (1) heating an adhesive in a heating tank;
- (2) pumping the adhesive through a conduit to an adhesive applicator for applying the adhesive to the substrate;
- (3) applying the superabsorbent particulate material to the coated substrate using conduits, nozzle sprayers, or the like.

The manufacturers of the adhesives used in the above described process typically specify the recommended temperature to which the adhesive should be heated prior to pumping the same to the applicator. The specific temperature to which the adhesive should be heated varies with the specific composition of the adhesive, however the specified temperature is below the boiling point of the adhesive at ambient pressure and yet high enough to sufficiently reduce the viscosity of the adhesive to permit the adhesive to be easily pumped from the tank to the adhesive applicator.

As shown in Figure 1, a conventional prior art system 100 for carrying out the above described process generally includes a heating tank 102, an adhesive applicator 104 for applying the adhesive to a moving web substrate 111 and a nozzle 108 or the like

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for applying superabsorbent particulate 109 to the web. A conduit 106 interconnects the tank 102 and the adhesive applicator 104 to convey adhesive from the heating tank 102 to the adhesive applicator 104 for application of the adhesive to the web 111. Conventional heating tanks typically include an integrated pump to convey the heated adhesive through the conduit 106. After the adhesive applicator 104 applies the adhesive to the web 111, the web is conveyed in a machine direction to the nozzle 108 or the like for applying the superabsorbent particulate 109 to the web. Conventionally, the conduit 106 is insulated and a plurality of heaters are often arranged in proximity to the conduit 106 to maintain the temperature of the adhesive substantially constant between the tank 102 and the adhesive applicator 104.

Commercially available heating tanks of the type used in the above system include the Nordson 3600, Orson 6000, Meltex GR and Meltex MX tanks from the Nordson Corporation. These tanks, like other such conventional tanks, have a pump incorporated therein to enable the heated adhesive to be pumped through the attached conduit to the adhesive applicator. A conventional adhesive applicator of the type used in the above described method above may comprise, for example, a slot coater. Suitable commercially available slot coaters include the Nordson EP-11 and EP-45 manufactured by the Nordson Corporation.

As discussed in the "Background" section above, prior art systems of the type shown in Figure 1 have inherent drawbacks. For example, since the superabsorbent particulate material is essentially sprayed on the coated web it is difficult to apply the particulate material to a pre-determined, localized area of the substrate. In particular, if the spraying of the powder is not initiated and terminated within a tightly defined time

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interval, the particulate may be delivered to undesired locations on the substrate.

Furthermore, the particulate material is often subject to spreading, *i.e.*, the particulate does not remain localized on the substrate and the particulate may migrate to locations where it is not desired, thereby contaminating the process.

5 In an effort to overcome the problems associated with the prior art process described with reference to Figure 1, adhesive/superabsorbent polymer particulate mixtures have been developed that are intended be applied in a single step using a conventional heating tank and adhesive applicator. In this manner, the separate step of applying the superabsorbent polymer to the coated web, by a nozzle or the like, is
10 eliminated. A commercially available superabsorbent/adhesive mixture is Fuller NW-1078, from the Fuller Corp.. However, as discussed in greater detail below, the inventors of the present invention have discovered that there are inherent difficulties associated with the application of superabsorbent/adhesive mixtures when using conventional heating tank-applicator systems of the type shown in Figure 1 and described above with
15 reference thereto.

Mixing superabsorbent particulate material with adhesive increases the viscosity of the resultant mixture as compared to the viscosity of the adhesive alone. Consequently, when the mixture is heated in a conventional heating tank to a temperature below the boiling point of the mixture, at ambient pressure, the viscosity of the mixture
20 cannot be reduced to a sufficient extent to thereby permit a pump in a conventional heating tank to adequately convey the mixture to the coater at an acceptable flow rate. Rather, due to the increased viscosity of the mixture, as compared to the adhesive alone, the pump is only able to convey the mixture at a reduced flow rate. Further, it has been

discovered that in order to reduce the viscosity of the mixture to an acceptable level, i.e. to a level where a pump of the type included with conventional heating tanks can convey the mixture at an acceptable flow rate, the mixture must be heated to a temperature in excess of the boiling point of the mixture at ambient pressure. Heating the mixture to such a high temperature is not acceptable, however, since boiling the mixture results in pump cavitations which also results in a reduction in the flow rate. Yet another problem with using conventional heating tank-coater systems to apply a superabsorbent/adhesive mixture is the pressure caused within the system is often higher than the equipment rating. Again, this is caused by the high viscosity of the superabsorbent/adhesive mixture. Still another problem with using conventional heating tank-coater systems to apply a superabsorbent/adhesive mixture to a substrate is that the applicator can accumulate a build up of the of the mixture, resulting from the high viscous nature of the mixture, thereby causing clogging.

In view of the above, the method according to the present invention includes the steps of:

(1) heating an adhesive and superabsorbent polymer mixture to a first temperature at a first pressure, the first temperature being less than the boiling temperature of the mixture at the first pressure;

(2) pumping the heated mixture through a heat exchanger at a second pressure, the second pressure being higher than the first pressure, the heat exchanger being adapted to raise the temperature of the mixture to a second temperature that is higher than the first temperature;

(3) selectively applying the mixture to a substrate.

Figure 2 schematically depicts a system 200 for carrying out the method according to the present invention. The system 200 comprises a heating tank 202, a heat exchanger 203 and an adhesive applicator 204 for applying an adhesive/superabsorbent polymer mixture to a substrate 211. The system further includes a first length of conduit 205 that connects the heating tank 202 to the heat exchanger 203 and a second length of conduit 207 that connects the heat exchanger 203 with the adhesive applicator 204. The heating tank 202 includes an integrated pump for conveying the adhesive through the first length of conduit 205, through the heat exchanger 203, through the second length of conduit 207, to the adhesive applicator 204.

The Nordson 3600 tank from the Nordson Corporation may be used as the heating tank 202 and the Nordson EP-11, also manufactured by the Nordson Corporation, may be used as the adhesive applicator 204.

Clearly, the diameter of the conduits 205 and 207 have a reduced diameter relative to the diameter of the heating tank 202. Thus, the superabsorbent/adhesive mixture is conveyed through the conduits 205 and 207 at a pressure that is higher than a pressure present in the heating tank 202. The heat exchanger 203 is preferably constructed from a coiled pipe (not shown in the figures) having a diameter that is the same as the conduits 205 and 207 and also includes a plurality of heaters (not shown) that are structured and arranged to raise the temperature of the mixture within the heat exchanger. Since the superabsorbent/adhesive mixture is conveyed through the heat exchanger 203 under pressure (i.e. at a higher pressure relative to the pressure present in the tank 202) the heat exchanger 203 can heat the superabsorbent/adhesive mixture to a temperature that would exceed the boiling point temperature of the mixture at the pressure present in the heating

tank 202. However, since the pressure is higher in the heat exchanger, relative to the
 pressure in the heating tank 202, the temperature of the superabsorbent/adhesive mixture
 may be raised without boiling the mixture. Moreover, by raising the temperature of the
 superabsorbent/adhesive mixture in the heat exchanger the viscosity of the mixture is
 5 reduced. The reduction in the viscosity of the superabsorbent/adhesive mixture functions
 to reduce the overall pressure experienced by the system thereby permitting a standard
 pump in a commercially available heating tank to convey the superabsorbent/adhesive
 through the system at rate that is acceptable for manufacturing purposes. More
 specifically, the system shown in Fig. 2 permits a the superabsorbent/adhesive mixture to
 10 be intermittently or continuously applied, using a conventional applicator, to a substrate
 moving at speeds in the range of 500-1000 fpm with an add-on level of the adhesive in
 the range of 45-80 gm.

Example #1

15 A heating tank-coater system was constructed in accordance with the system depicted
 in figure 1. A Nordson 3600 heating tank was used as the heating tank. The pump
 included in the heating tank was a 0.833 cc/rev pump. The adhesive applicator was a
 Nordson EP-45 coater having a .010" thick shim with a 12.5 opening. A conventional
 5/16" I.D. insulated hose was used to convey the adhesive/superabsorbent mixture from
 20 the heating tank to the applicator. A plurality of conventional heaters were arranged
 around the hose to maintain the fluid temperature substantially constant within the hose.

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Fuller NW-1078 was used as the adhesive/superabsorbent mixture. The substrate speed was set at 850 fpm and the add-on level for applying the adhesive/superabsorbent mixture to the substrate was set to apply the adhesive mixture at a target rate of 65 gm.

Using the above described system it was observed that heating the
5 adhesive/superabsorbent mixture in the tank to a temperature higher than 250° F caused the mixture to boil, which in turn caused cavitation at the pump. The pump cavitation in turn caused inconsistent adhesive add-on levels. It was further observed that heating the adhesive/superabsorbent mixture to a temperature below 250° resulted in the
10 adhesive/superabsorbent mixture being too viscous, resulting in excessive pressure within the system, thereby causing pump failure.

Example #2

A system according to the present invention was constructed in the manner depicted in Figure 2. A Nordson 3600 heating tank was used as the heating tank the applicator
15 was a Nordson EP-45 coater having with a .010" thick shim with a 12.5 opening. The pump included in the heating tank was a 0.833 cc/rev pump .

A heat exchanger was arranged between the heating tank and the applicator. The heat exchanger consisted of an coiled aluminum tube and a plurality of cartridge heaters arranged in heat transfer relationship with the coiled tube. The inner diameter of the
20 aluminum tube was approximately 5/16" I.D. and the tube had an overall length of about 12 feet. A first length of 5/16" I.D. insulated hose was used to connect the heating tank to a first end of the aluminum tubing. A second length of 5/16" I.D. hose was used to connect a second end of the aluminum tubing with the applicator.

Fuller NW-1078 was used as the adhesive/superabsorbent mixture. The substrate speed was set at 850 fpm and the add-on level for applying the adhesive/superabsorbent mixture was set to apply the adhesive mixture at a target rate of 65 gsm.

The adhesive/superabsorbent mixture was heated to a temperature of 250° F in the heating tank and conveyed through the first length of tubing to the heat exchanger. Conventional heaters were arranged about the first length of tubing to maintain the temperature within the first length of tubing substantially constant at 250°.

Cartridge heaters were arranged about aluminum tubing of the heat exchanger, and the heaters were set to raise the temperature of the adhesive/superabsorbent mixture within the heat exchanger from a temperature of 250° F to a temperature of 300° F. The flow rate of the adhesive/superabsorbent mixture through the heat exchanger was measured to be about 65 grams per minute. Heaters were arranged around the second length of hose between the heat exchanger and the applicator to substantially maintain the temperature of the mixture within the second length of hose at approximately 300°.

The heat exchanger functioned to raise the temperature of the adhesive/superabsorbent mixture and thereby lower the viscosity of the adhesive/superabsorbent mixture resulting in reduction of the overall pressure in the system. This allowed the a 0.833 cc/rev pump in the Nordson 3600 heating tank to effectively convey the adhesive through the system so that the target add-on of 65 gsm of the adhesive/superabsorbent mixture was met at the substrate speed of 850 fpm.

The method and system according to the present invention has been described above with reference to the application of an adhesive/superabsorbent mixture to a continuous substrate. However, the same method and system could also be used to apply

such a mixture to discrete articles, such as disposable diapers, sanitary napkins, pantliners, etc..

The foregoing disclosure is directed to various specific embodiments of the present invention, however, other further embodiments maybe devised without departing
5 from the scope of the present invention.

CLAIMS

We claim:

1. A method for applying an adhesive/superabsorbent mixture to a substrate comprising
5 the steps of:

heating an adhesive and superabsorbent polymer mixture to a first temperature at
a first pressure, said first temperature being less than the boiling temperature of said
mixture at said first pressure;

10 passing the heated mixture through a heat exchanger at a second pressure, the
second pressure being higher than the first pressure, the heat exchanger being adapted to
raise the temperature of the mixture to a second temperature that is higher than said first
temperature; and

selectively applying the mixture to a substrate.

15 2. The method according to claim 1, wherein said first pressure is substantially equal to
ambient pressure.

3. The method according to claim 1, wherein said mixture is applied to said substrate by
an adhesive applicator.

20 4. The method according to claim 3, wherein said adhesive applicator is a slot coater.

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5. The method according to claim 1, wherein said substrate is moving at a speed in the range of 500-1000 fpm.

6. The method according to claim 3, wherein said mixture is heated in a heating tank.

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7. The method according to claim 6, further comprising:

conveying said mixture through a first length of conduit arranged between said heating tank and said heat exchanger, and

conveying said mixture through a second length of conduit arranged between said heat exchange and said adhesive applicator.

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8. The method according to claim 7, further comprising:

heating said first length of conduit to maintain a temperature of said mixture within said first length of conduit substantially constant.

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9. The method according to claim 7, further comprising:

heating said second length of conduit to maintain a temperature of said mixture with said second length of conduit substantially constant.

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10. The method according to claim 1, wherein said first temperature is in the range of about 200° F to about 250° F.

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11. The method according to claim 1, wherein said second temperature is in the range of about 250° to about 350°.

12. The method according to claim 1, wherein said first temperature is about 250° F and said second temperature is about 300° F.

13. The method according to claim 1, wherein said adhesive is applied at a rate of about 45 gsm to about 80 gsm.

14. The method according to claim 1, wherein said substrate is a non-woven substrate.

15. The method according to claim 1, wherein said second pressure is in the range of about 50 psi to about 500 psi.

16. A system for applying an adhesive/superabsorbent mixture to a substrate comprising:
a heating tank for heating an adhesive and superabsorbent polymer mixture to a first temperature at a first pressure, said first temperature being less than the boiling temperature of said mixture at said first pressure;

a heat exchanger in flow communication with said heating tank for heating said mixture at a second pressure, the second pressure being higher than the first pressure, the heat exchanger being adapted to raise the temperature of the mixture to a second temperature that is higher than said first temperature; and

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an adhesive applicator in flow communication with said heat exchanger for selectively applying the mixture to a substrate.

17. The system according to claim 16, wherein said first pressure is substantially equal to ambient pressure.

18. The system according to claim 16, wherein said adhesive applicator is a slot coater.

19. The system according to claim 16, wherein said substrate is a moving substrate moving at a speed in the range of 500-1000 fpm.

20. The system according to claim 16, further comprising:

a first length of conduit arranged between and connecting said heating tank and said heat exchanger; and

a second length of conduit arranged between and connecting said heat exchange and said adhesive applicator.

21. The system according to claim 20, further comprising at least one heater structured and arranged to heat said first length of conduit and maintain a temperature of said mixture within said first length of conduit substantially constant.

22. The system according to claim 20, further comprising at least one heater structured and arranged to heat said second length of conduit and maintain a temperature of said mixture within said second length of conduit substantially constant.

23. The system according to claim 16, wherein said first temperature is in the range of about 200° F to about 250° F.

24. The system according to claim 16, wherein said second temperature is in the range of about 250° to about 350°.

25. The system according to claim 16, wherein said first temperature is about 250° F and said second temperature is about 300° F.

26. The system according to claim 16, wherein said adhesive applicator is structured and arranged to apply said adhesive to said substrate at a rate of about 45 gsm to about 80 gsm.

27. The system according to claim 16, wherein said second pressure is in the range of about 50 psi to about 500 psi.

ABSTRACT

A method and system for applying an adhesive/superabsorbent mixture to a substrate, the method and system being adapted for heating an adhesive and superabsorbent polymer mixture to a first temperature at a first pressure, the first temperature being less than the boiling temperature of said mixture at the first pressure; heating the mixture through a heat exchanger at a second pressure, the second pressure being higher than the first pressure, the heat exchanger being adapted to raise the temperature of the mixture to a second temperature that is higher than the first temperature; and selectively applying the mixture to a substrate.

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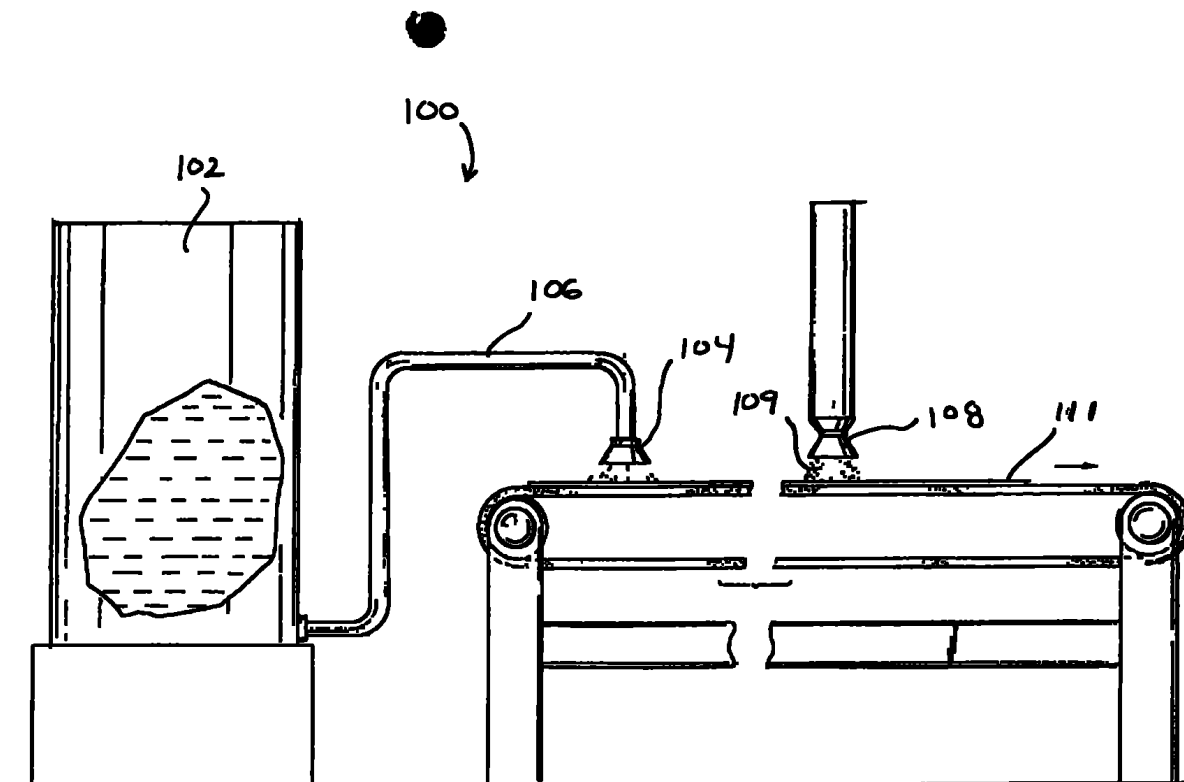


FIG. 1
(Prior Art)

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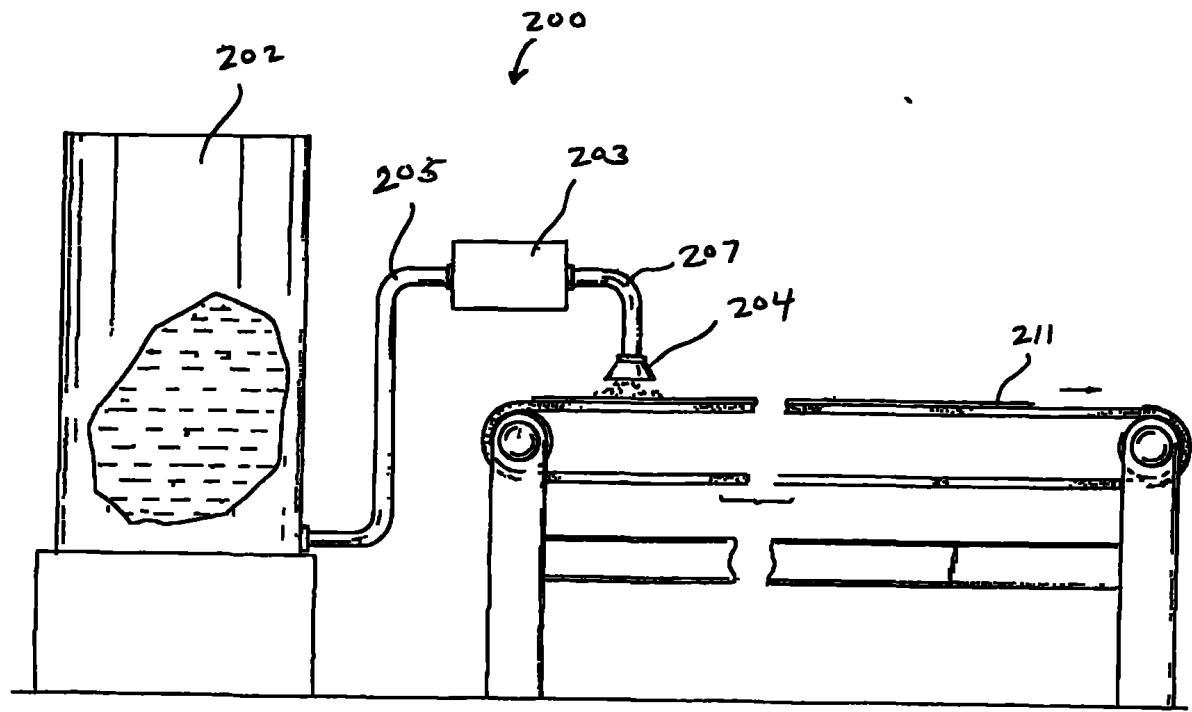


FIG. 2

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