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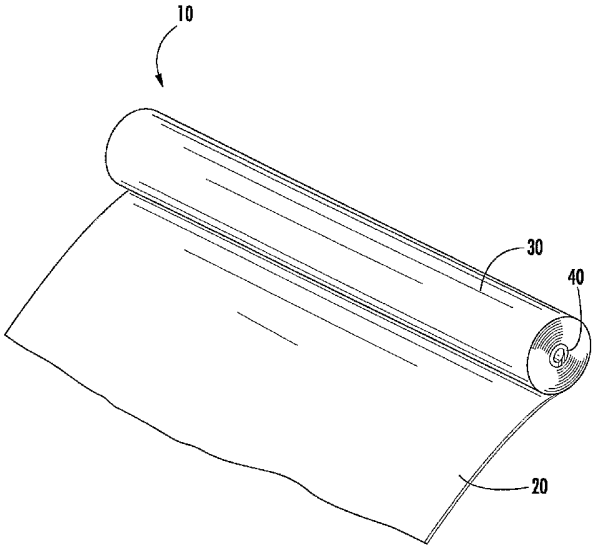
(54) Title: NONWOVEN FABRIC FOR CLEANING PRINTING MACHINES



(57) **Abstract:** The invention is a cleaning material (20) for cleaning printing machines. The cleaning material (20) is comprised of a spunbonded nonwoven fabric that has been impregnated with a low volatily organic cleaning composition. Typically, the spunbonded nonwoven fabric is comprised of polyethylene terephthalate homopolymer filaments that are point bonded together to produce a fabric having high strength and abrasion resistance. Esters containing 2-ethyl hexanoate are particularly useful solvents that can be used as the cleaning composition. The cleaning material (20) can be wound onto a roll (10) that can be adaptable to fit commercially available printing machine cleaning devices.

WO 2005/113243 A1

NONWOVEN FABRIC FOR CLEANING PRINTING MACHINES

BACKGROUND OF THE INVENTION

The invention relates generally to a cleaning material that can be used to clean a printing machine, and more particularly to a cleaning material in the form of a nonwoven fabric impregnated with a cleaning composition.

One of the more common printing techniques is offset lithography printing. In offset printing, an ink roll transfers ink to a plate cylinder. The plate cylinder typically contains lithographic plates that are wrapped around the circumference of the cylinder. After the lithographic plates contact the ink roller, the plate cylinder then transfers the inked impression onto a blanket cylinder. The blanket cylinder is typically made of a soft material such as rubber. The blanket cylinder transfers the inked impression to a printable surface such as a continuous web of paper. In a blanket-to-blanket press, the paper web is fed between two blanket cylinders so that both sides of the paper are printed at once.

During the printing process, ink, dirt, and other residues may accumulate on the blanket cylinders. The accumulation of such residues can cause various problems, such as poor print image quality and damage to the blanket. Additionally, the blanket cylinder should be cleaned when the plates on the plate cylinder are changed.

Traditionally, when a printing press needed cleaning, the press would be taken off-line and the equipment would be hand cleaned with solvents. Hand cleaning the printing press has several disadvantages. Hand cleaning can be labor intensive and possibly very time consuming, which could result in the printing press having to be off-line for a significant amount of time.

Several automated systems have been developed to improve printing press cleaning, reduce the amount of solvent consumed, and to lessen the amount of printing press downtime. Typically, these systems involve the use of a cleaning

fabric that is applied to the surface of the rollers and cylinders. The cleaning fabric is usually applied to the rollers and cylinders under tension or pressure so that the cleaning fabric has adequate contact with the surfaces that are being cleaned. The cleaning fabric can be unrolled from a roll and directed into contact with the blanket surface. The used portions of the fabric are then typically rolled onto a separate uptake roll for later disposal. Typically, the cleaning fabrics are made from spunlaced nonwovens that are composed of short wood pulp fibers about ¼ inch long and polyester staple fibers about 1.5 inch in length. The fibers are bonded together by hydroentanglement. Cleaning fabrics of this type are described, for example, in U.S. Patent Nos. 5,368,157 and 6,263,795.

Although cleaning fabrics employing spunlaced nonwoven fabrics have enjoyed widespread use in the cleaning of printing presses, there exists a need for an improved cleaning fabric with improvements in strength, cleaning performance and economics.

BRIEF SUMMARY OF THE INVENTION

The present invention provides a material for cleaning printing press cylinders comprised of a spunbond nonwoven fabric that is impregnated with a cleaning composition. The cleaning composition is typically comprised of a low volatility solvent and surfactant. The impregnated cleaning material can be tightly wound onto a roll that can be used with commercially available cleaning devices.

The spunbond nonwoven fabric used in the cleaning material of the invention comprises a web of substantially continuous filaments thermally point bonded together to provide a fabric with excellent strength and abrasion resistance while being able to carry and release adequate amounts of a cleaning solvent. The spunbonded nonwoven fabric has a relatively low loft or volume, making it adeptly suited for being tightly wound on a roll without the need for post calendering.

Cleaning compositions that are useful in the invention are typically comprised of a low volatility organic solvent and surfactant. Esters are a particularly suitable class of organic solvents because they are biodegradable and many exhibit a low vapor pressure. Thus, the invention provides an improved printing machine cleaning material having high strength and abrasion resistance

that is impregnated with an exceptionally effective cleaning composition that does not deteriorate the surface of the printing blanket.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

Having thus described the invention in general terms, reference will now be made to the accompanying drawing, which is not necessarily drawn to scale, and wherein:

FIG. 1 illustrates a cleaning material that is wound onto a roll around a central core.

DETAILED DESCRIPTION OF THE INVENTION

The present invention now will be described more fully hereinafter with reference to the accompanying drawing, in which some, but not all embodiments of the invention are shown. Indeed, the invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements.

The cleaning material is comprised of a spunbonded nonwoven fabric that is impregnated with a low volatility cleaning composition. With reference to FIG. 1, reference number **10** broadly designates a roll of cleaning material that is in accordance with the invention. As depicted in FIG. 1, the cleaning material **20** is wound around a central core **40** to form a roll of cleaning material.

The size, shape, and configuration of the roll **10** and core **40** can be adjusted so that the roll of cleaning material **10** can be used interchangeably with commercially available printing press cleaning devices. The cleaning material can be integrated into an automatic blanket cleaning system so that at a desired time the cleaning material is applied to the blanket with even pressure. Cleaning is accomplished by friction between the cleaning material and the blanket, and the dissolution of inks on the blanket. The used portion of the cleaning material can be reeled onto a take-up shaft or similar device.

The spunbond nonwovens used in the present invention are made from continuous polymeric filaments that are thermally bonded together. Generally, spunbond nonwoven fabrics are prepared by extruding a thermoplastic polymer

through a large number of fine spinneret orifices to form a multiplicity of continuous filaments, and the filaments of molten polymer are solidified and then drawn or attenuated, typically by high velocity air, and then randomly deposited on a collection surface. The filaments are then bonded to give the web coherency and strength. Area bonding and point bonding are two common techniques for bonding the web. Area bonding typically involves passing the web through a heated calendar composed of two smooth steel rollers or passing heated steam, air or other gas through the web to cause the filaments to become softened and fuse to one another. Point bonding consists of using a heated calender nip to produce numerous discrete bond sites. The point bonding calender nip is comprised of two nip rolls, wherein at least one of the rolls has a surface with a pattern of protrusions. Typically, one of the heated rolls is a patterned roll and the cooperating roll has a smooth surface. As the web moves through the calender roll, the individual filaments are thermally bonded together at discrete locations or bond sites where the filaments contact the protrusions of the patterned roll. Preferably, the calender rolls are engraved with a pattern that produces point bonds over about 10 to 40 percent of the area of web surface, and more preferably about 20 to 30 percent.

For the present invention, thermal point bonding either with heat and pressure or by ultrasonics is the preferred bonding process because it coheres the filaments in small, discrete, and closely spaced areas of the web to produce a fabric that is quite strong and abrasion resistant. Point bonding imparts considerable strength to the fabric while retaining the integrity of the fibrous structure on both surfaces. In contrast, other bonding methods that are used to achieve high strength fabrics, such as area bonding, can result in glazing the surface of the fibers. As a result, the fibers can lose much of their fibrous nature and become "film-like." This is usually an undesirable result because a cleaning cloth that is film-like will not typically clean as well as a fibrous cleaning cloth. On the other hand, if the thermally bonded nonwoven is too lightly bonded, the fibers near the surface might maintain their fibrous nature, and as a result, the abrasion resistance of the fabric could be compromised. The fibrous surface of the highly abrasion resistant point bonded fabric contributes to the ability of the fabric to remove ink and debris from

the surfaces of the printing press undergoing cleaning. Additionally, patterned point bonding creates a fabric structure having a large number of "pockets" of relatively uncompacted filaments located between the more compacted and densified point bond sites. This structure enhances the ability of the fabric to hold and retain cleaning solvent during storage of the cleaning material prior to use, and to release the solvent onto the surfaces of the printing press during the cleaning operation. As a result, cleaning materials that are prepared in accordance with the invention are adeptly suited for removing ink and other residues from printing machinery.

Spunbonded nonwoven fabrics can be prepared from a variety of different thermoplastic polymers that are capable of being melt spun to form filaments. Examples of polymers that can be used to form the spunbonded nonwoven fabric include, without limitation, polyester, polyamide, polyolefins such as polypropylene, polyethylene, and olefin copolymers, or other thermoplastic polymers, copolymers and blends. These polymers may also be used in any combination or shape to from bicomponent or tricomponent filaments.

A particularly useful spunbond nonwoven fabric is comprised of polyester filaments, and more particularly is formed from polyester homopolymer filaments. A variety of additives can be used with the hompolymer including, but not limited to, optical brighteners, delusterants, opacifiers, colorants, antistats, and other common melt additives. A fibrous binder may also be included within the spunbond nonwoven fabric during the manufacturing process as continuous binder filaments in an amount effective to induce an adequate level of bonding. The binder is typically present in an amount ranging from about 2 to 20 weight percent, such as an amount of about 10 weight percent. The binder filaments are generally formed from a polymer composition exhibiting a melting or softening temperature at least about 10° C lower than the homopolymer continuous filaments. Exemplary binder filaments may be formed from one or more lower melting polymers or copolymers, such as polyester copolymers. In one advantageous embodiment of the invention, the spunbond layer is produced by extruding polyester homopolymer matrix filaments (polyethylene terephthalate) interspersed with binder filaments formed from a lower melting polyester copolymer, such as polyethylene

isophthalate. Typically, the homopolymer filaments constitute the matrix fiber and the copolymer filaments have a lower melting point and constitute a binder filament. Generally, as the web passes through the calender rolls, discrete point bonds are formed where the patterned roller contacts the individual filaments. The portions of the binder filaments that contact the heated protrusions on the calender roll are melted or rendered tacky while in contact with the heat calender roll, and as a result, the binder and matrix fibers are bonded to together to form a strong coherent fabric.

Suitable spunbond nonwoven fabrics should have a machine direction tensile strength typically of about 11,000 grams per inch (2.54 cm) and at least 5,000 grams per inch (2.54 cm). The spunbonded nonwoven fabrics should also typically have a basis weight of from 40 to 125 grams per square meter (gsm), and more desirably from about 60 to 90 gsm. The fabric typically has a machine direction elongation from about 19 to 49 percent, and somewhat more typically about 34 percent. The fabric typically has a Frasier porosity of at least 100 cubic feet of air per minute per square foot of fabric at a pressure differential of 0.5 inches of water.

The cleaning cloth is typically impregnated with a cleaning composition that is comprised of a low volatility solvent that does not readily evaporate at ambient temperature and pressure. There are a wide variety of different solvents that can be used in the practice of the invention. Typically, the solvent is an organic compound solvent or mixture of low volatility organic compound solvents with flash points above 130° C. It is desirable that the solvents have a low volatility because the impregnated roll may be exposed to the atmosphere for up to 30 days after it has been removed from the sealed wrapper. In addition, a very high surface area of the solvent is exposed to the atmosphere due to the high surface area of the nonwoven fabric.

The amount of cleaning composition present in the cleaning material is typically from about 20 to 200 gsm. Less cleaning composition, typically from about 20 to 100 gsm, is required on sheet fed presses that run at speeds up to 20,000 impression cylinder revolutions per hour. More cleaning composition,

typically from about 80 to 200 gsm, is required on web fed presses that run at speeds exceeding 20,000 impression cylinder revolutions per hour.

Esters are particularly useful as organic solvents because they are typically biodegradable and many exhibit low vapor pressure. Suitable esters include, without limitation, both monobasic and dibasic esters having flash points that are about 130° C or greater.

Particularly suitable esters are branched chain monobasic and dibasic esters that contain 2-ethyl hexanoate because they provide exceptional cleaning power. These include, without limitation, di(propylene glycol) di-2-ethylhexanoate, di (ethylene glycol) di-2-ethylhexanoate, neopentylglycol di-2-ethylhexanoate, 1,6-hexanediol di-2-ethylhexanoate (1:1), di-2-ethylhexyl adipate, octyl / decyl 2-ethylhexanoate. An exemplary cleaning composition includes octyl / decyl 2-ethylhexanoate. The amount of branched chain monobasic and dibasic esters that contain 2-ethyl hexanoate in the composition can be from about 0 to 100 percent by weight. An additional novel feature of these esters is that though exhibiting strong ink solvency, they have minimal interaction with the polymeric blanket substrates used for lithographic printing. This minimal interaction with polymeric substrates allows for efficient cleaning of the blanket without surface deterioration after repeated wiping cycles.

Isobutyl stearate is an excellent additive when in combination with branched chain monobasic and/or dibasic esters that contain 2-ethyl hexanoate. Isobutyl stearate is a common, low cost fluid with exceptional lubricity. Lubricity is helpful in reducing abrasion between the nonwoven fabric and the blanket. Isobutyl stearate cannot be used alone because of its low cleaning power. The amount of isobutyl stearate in the composition can be from about 0 to 50 percent by weight.

Other low volatility solvents can be used in cleaning composition including, without limitation, esters, methyl esters, glycols, aromatic hydrocarbons, branched or unbranched aliphatic hydrocarbons, and combinations and blends thereof. Preferred solvents have a flashpoint above 130° C so that they evaporate slowly are not classified as a flammable liquid.

The cleaning composition can also contain surfactants. The addition of a surfactant will help emulsify water that may be present on the presses. Water may be sprayed on the blanket to assist in removing any dirt or paper dust that may have accumulated. The amount of surfactant present in the solvent composition is typically from about 0 to 40 % by weight. A somewhat more typical range is from about 5 to 15 % by weight. The surfactant can also help remove ink residue by suspending it in water that can be removed from the surface. Additionally, the surfactants can act as an emulsifier between the aqueous, acidic or alkaline phase and the hydrocarbon phase. It is believed that the emulsion drops help loosen the printing ink and suspend it in the aqueous phase and support the surfactant molecules in stabilizing the emulsion while also stabilizing any droplets containing printing ink. Typically, the surfactant can be non-ionic, anionic, or cationic. An exemplary surfactant suitable for use in the present invention is Ethox 2680, which is an alkyl, polyoxyalkylene glycol ether.

One exemplary cleaning composition formulation contains 75 percent by weight octyl / decyl 2-ethylhexanoate, 20 percent by weight isobutyl stearate, and 5 percent by weight alkyl, polyoxyalkylene glycol ether surfactant.

Typically, the wrapper or container in which the cleaning material is packaged is impermeable to fluids and substantially impermeable to vapors. The wrapper and container can be made from a variety of different materials such as a film made from thermoplastic resin. The cleaning cloth is typically stored in the sealed wrapper or container until it is needed. At the appropriate time, the cleaning cloth can be removed from the wrapper and used to clean a printing press cylinder or blanket.

Many modifications and other embodiments of the invention set forth herein will come to mind to one skilled in the art to which the invention pertains having the benefit of the teachings presented in the foregoing descriptions and the associated drawing. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

THAT WHICH IS CLAIMED:

1. A cleaning material for cleaning printing machines comprising a spunbond nonwoven fabric formed of substantially continuous thermoplastic polymeric filaments bonded to one another to impart strength and abrasion resistance to the fabric, the spunbond nonwoven fabric having a machine direction tensile strength of at least 5,000 grams per inch and basis weight of from 40 to 125 gsm, and the fabric being wound into the form of a roll, and a low volatility cleaning composition impregnating the roll of spunbond nonwoven fabric.

2. The cleaning material of claim 1, additionally including a sealed wrapper surrounding the roll of impregnated fabric.

3. The cleaning material of claim 1 or 2, additionally including a core around which the fabric is wound into the form of a roll.

4. The cleaning material of claim 1, 2 or 3, wherein the spunbond nonwoven fabric is a thermally point bonded nonwoven fabric.

5. The cleaning material of any one of claims 1 to 4, wherein the filaments of the spunbond nonwoven fabric are polyester filaments.

6. The cleaning material of any one of claims 1 to 5, wherein the cleaning composition is present in the nonwoven fabric at from about 20 to 200 gsm.

7. The cleaning material of any one of claims 1 to 6, wherein the cleaning composition includes an ester.

8. The cleaning material of claim 7, wherein the cleaning composition includes a surfactant.

9. The cleaning material of claim 8, wherein the cleaning composition includes a hydrocarbon solvent having a flash point above 130° C.

10. The cleaning material of any one of claims 1 to 9, wherein the nonwoven fabric has a Frasier porosity of at least 100 cubic feet of air per minute per square foot of fabric at a pressure differential of 0.5 inches of water.

11. The cleaning material of any one of claims 1 to 10, wherein the fabric has point bonds that cover about 10 to 40 percent of the area of the fabric surface.

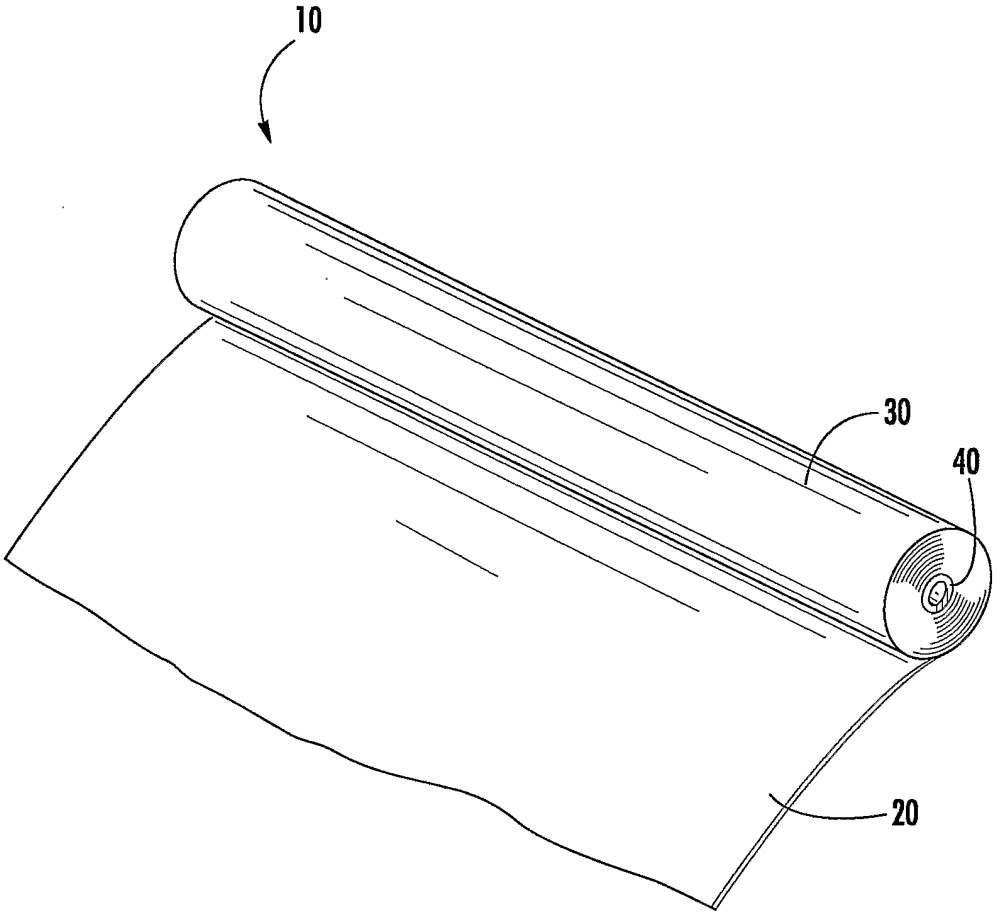


FIG. 1

INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B41F35/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B41F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 368 157 A (GASPARRINI ET AL) 29 November 1994 (1994-11-29) cited in the application column 3, line 56 - column 5, line 41 figure 1	1-5,9
Y	US 2002/187307 A1 (TANAKA MAKOTO ET AL) 12 December 2002 (2002-12-12) paragraphs '0002!, '0005!, '0006! paragraph '0012! - paragraph '0020! paragraph '0092!	1-5,9
A	DE 296 24 381 U1 (HEIDELBERGER DRUCKMASCHINEN AG) 12 December 2002 (2002-12-12) the whole document	1,3,8

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Curt, D

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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