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(54) **Printing blanket with improved release characteristics.**

(57) The present invention relates to printing blanket construction which provides a non-uniform, randomly microstructured printing surface. The printing surface is prepared by (a) covering an unvulcanized printing blanket outer surface with a release paper having a Gloss (60°) from about 2 to about 4 and a release from unvulcanized rubber at 20°C less than about 20 g/25mm, (b) vulcanizing the paper covered surface to cure the outer surface, and (c) removing the paper to expose a printing surface with a perthometric roughness of from about 4 um to about 25 um. The resulting printing surface provides improved print quality, improved ink release and a low degree of tack toward printer paper. The present invention also relates to the method of preparing the above printing blanket composition.

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This invention relates to an improved printing blanket construction and to an improved method for making a printing blanket construction.

It is known to provide a printing blanket construction comprising an outer layer formed mainly of polymeric/elastomeric material and having an outer printing surface for carrying liquid printing ink or the like for printing purposes or the like. For example, see the U.S. Patent No. 1,778,185, to DeVries; the U.S. Patent No. 3,025,186, to Eekhout et al; the U.S. Patent 3,418,864 to Ross; the U.S. Patent No. 3,795,568, to Rhodarmer et al; the U.S. Patent No. 3,881,045, to Strunk and the U.S. Patent No. 4,015,046, to Pinkston et al.,

It is known that the structures of the outer printing surfaces of prior known printing blanket constructions have been controlled by grinding texture therein or by using a curing liner, such as ordinary paper, in combination with a dusting or texturing material, normally talc, disposed against the uncured surface and then being removed therefrom after the outer layer means has been cured through vulcanization.

It has been suggested in the printing blanket art that the topography of the printing surface can affect print quality. German Patent App. No. 2,660,483, filed June 29, 1976 suggests that customary roughened printing blankets impair the precipitation of ink and generate a suction effect which results in an irregular print surface. The German Application further suggests that print quality can be improved by exposing a printing surface with regularly defined, microstructed surface. U.S. Pat. 4,751,127 issued June 14, 1988 to Pinkston et al., suggests that print quality can be improved by preparing a print surface having a relatively large number of separate ink wells interrupting the printing surface in a closely spaced, generally uniform pattern throughout substantially the entire printing area thereof, each having a mouth opening at the printing surface having a substantially straight-line length across the largest portion thereof of approximately 3 microns to approximately 65 microns.

In contrast to German Patent application No. 2,660,483 and U.S. Patent 4,751,127, it is an object of the present invention to provide a non-uniform, randomly microstructured printing surface which produces improved print quality.

Furthermore, it is an object of the present invention to provide a print surface which additionally exhibits improved ink release and printed paper release characteristics.

It is also an object of the present invention to provide a method of preparing the improved printing surface.

Finally, it is an object of the present invention to provide a printing blanket which imparts a low degree of sheet curl.

These and other objects will become apparent from the following discussion.

The present invention relates to a printing blanket constructions including a rubber outer layer, said outer layer having a printing surface for carrying printing ink, said printing surface being formed by covering the unvulcanized rubber layer with a release paper having: a Gloss at an angle of 60° from about 2 to about 4 and a release from vulcanized rubber at 20°C less than about 20g/25mm; vulcanizing the paper covered surface under pressure to cure the rubber; and removing the paper to expose a printing surface with a perthometric roughness of from about 4 to about 25 um (preferably from about 8 to about 16 um).

The present invention also relates to a method of making a printing blanket construction including the steps of forming an outer layer of said construction having a printing surface thereon, said printing surface being formed by covering the unvulcanized rubber layer with release paper having: a Gloss (60°) from about 2 to about 4 and a release from vulcanized rubber at 20°C less than,about 20 g/25mm (preferably less than about 8 gm/25mm) vulcanising the paper covered surface under pressure to cure the rubber, and removing the paper to expose a printing surface with a perthometric roughness of from about 4 to about 25 um (preferably about 8 to about 16 um).

FIG.1 is a scanning electron micrograph of the printing surface of a printing blanket construction of this invention magnified 540X.

FIG.2 is a scanning electron micrograph of a commercial printing blanket construction prepared according to the method described in U.S. patent 4,751,127 issued June 14, 1988 to Pinkston et al., magnified 540X.

Blanket Preparation:

It is well known that a printing blanket construction is formed by providing a cured outet polymeric/elastomeric layer of a desired thickness on a cured backing structure.

In general, one prior known method of making an outer layer of a blanket construction is by mixing an unvulcanized rubber compound into a suitable solvent and subsequently knife coating the solution onto a fabric carcass in a multiplicity of thin coats. After each coat of solution, the solvent thereof is allowed to evaporate so that the resultant layer of rubber is substantially solvent free. The rubber is then cured through vulcanization.

Some rubber compounds that have been used for forming an outer layer of a blanket construction in the above manner comprise acrylonitrile-butadiene rubber, isobutyleneisoprene elastomer, polysulfide rubber, ethylene-propyl-diene terpolymer, natural rubber, styrene-butadiene rubber, and a blend of acrylonitrile-butadiene and polysulfide rubber.

However, it is to be understood that the outer layer of this invention can be formed of any suitable

polymeric material and in any suitable manner, whether or not the same has been specifically set for the above or has been disclosed in the aforementioned references that have been incorporated into this disclosure, as it is believed that the unique features of this invention are not limited to any one particular outer material, curing method or apparatus.

It is also well known that the surface of the printing blanket construction can be altered by mechanically brushing the surface or by contacting the surface with a textured surface prior to curing.

Surprizingly, it has been discovered that excellent ink release, paper release and other printing blanket characteristics can be achieved by covering an uncured or unvulcanized rubber outer layer with a narrowly defined release sheet and then curing the rubber. These sheets can be made of teflon, paper, fabric, plastic, or metal. The preferred release sheet is release paper.

The release agent found on the release sheet can be any one of a number of siliconates. Useful siliconates comprise the highly water-soluble, alkali-metal alkyl siliconates. Representative of the alkali metals are sodium, potassium and lithium, while suitable alkyl groups are methyl and ethyl. Some commercial examples are as follows:

Dow Corning 771 and 772: Aqueous solutions of sodium siliconates.

General Electric SC-50: Aqueous solution of the mono-sodium salt of methyl siliconic acid.

Union Carbide R-20: Aqueous solution of the mono-sodium salt of methyl siliconic acid.

The siliconate may be used alone, but preferably it is mixed with a hydrophilic film former such as polyvinyl alcohol, carboxymethyl, cellulose, starch or the like.

The prefered release sheet is Stripkote VEZ Supermat release paper manufactured by S.D. Warren Co., Westbrook, Maine.

The surface of the release sheet is important to the present invention. The release sheet must have a Gloss (60°) of from 2 to about 4 (preferably about 3) as measured by the Hunter Method. The Hunter method measures directional reflectance to determine surface gloss. A Hunter D25-Z colorimeter with a gloss sensor may be utilized for this purpose. For a detailed discussion of gloss determinations, see Mark, Handbood of Physical and Mechanical Testing of Paper and Paperboard, Vol.2, pp 16-45 (1984), incorporated herein by reference. The release sheet must impart a perthometric roughness of from about 4 to about 25 um (preferably from about 8 to about 16 um) to the cured printing surface. (See analytical method below). Finally, the sheet must have a release from cured/vulcanized rubber of less than about 25 g/25mm (preferably from 0 to about 8 g/25mm). Release values are determined on the commonly used Keil Tester, operating at a 180-degree peel angle and 12 in./min. peel speed. Release values are erpressed as force (in grams) per 25mm of tape width. For a detailed discussion of release testing, see Satas, Handbook of Pressure Sensitive Adhesive Technology, seconded (1989), pp 624-626, incorporated herein by reference.

In a commercial printing blanket manufacturing operation the printing blanket material is prepared in a continuous sheet and is taken-up on a roll. During commercial production of the present printing blankets, the release sheet is typically contacted with the uncured rubber during a similar roll winding operation at a wind-up tension of from about 2 to about 40 psi.

Optionally, the uncured rubberized surface can be coated with a thin layer of a dusting agent prior to covering with release paper. The dusting agent can aid in the ultimate release of the paper from the vulcanized rubber. The dusting agent can be any conventional dusting agent used in the printing blanket manufacturing art, e.g., talc, mica, silica or mixtures thereof. The preferred dusting agent is talc.

In the process of the present invention, the paper covered surface is vulcanized under pressure to cure the outer rubber surface. See, for example, in U.S. Patent No. 3,418,864, incorporated herein by reference. The release sheet is ultimately removed to expose the finished printing surface. The method of release paper removal is not critical to the present invention. In fact, typically, the release sheet will merely fall off during the unwinding of a roll of printing blanket material.

The Printing Blanket:

The printing blanket construction of the present invention exhibits many beneficial characteristics. First, the method of manufacture is less labor/material intensive than prior art methods; such as those described in German Patent Application No. 2,660,483 or U.S. Patent No. 4,751,127, discussed above. Second, the product surface exhibits improved paper release (or lack of tack) in combination with improved ink transfer characteristics. The printing paper release is from about 0 to about 8 gsi (preferably from 0 to 4 gsi) as measured by the method described below. The ink release from the present printing blanket surface is good to excellent. Furthermore, the present printing surface imparts print quality reproduction which is good to excellent.

Applicants have observed that printing surfaces vary in their propensity to release printed paper, i.e. "tack". This is especially prominent in the blankets prepared according the method detailed in U.S. Patent 4,751,127, which tend to hold on to the printed paper. Without being bound to theory, applicants theorize that the closely spaced, generally uniformly distributed, "ink wells" of the '124 blankets may produce a suction cup effect which makes the paper

adhere to the printing blanket. These "ink well" suction cups can be readily seen from the photomicrograph of FIG.2.

By contrast, the present blanket surface is characterised by a non-uniform random distribution of regularly shaped valleys, typically spaced at an average of at least 2 mean valley diameters apart. (See FIG.1) Thus, the present printing blanket construction does not have the severe paper tack problem of the '127 blankets. Furthermore, the blankets of the present invention impart nearly no sheet curl.

Analytical values discussed herein were determined by the following methods unless otherwise specified:

Analytical Dtermination

A. Roughess Determination

Equipment

1.Perthometer S6P surface measuring and recording instrument, manufactured by Perthen GmbH, West Germany.
2. Model PRK drive unit equipped with a model TOR-250 Tracing Probe, manufactured by Perthen GmbH, West Germany.

Procedure

1. The paper sample is placed on the testing surface.
2. The Tracing System head is placed on the paper.
3. The average roughness (RZ), in um, is determined under the following instrument settings:
LT = 5.60 mm
LM = 4.00 mm
LC = 0.80 mm
Measuring program 1
∧rofile R

B. Rubber Tack Determination

Equipment

1. Model 9 plate guage, manufactured by Vandercook & Sons, Inc., Chicago, IL.
2. 1″ wide coated paper test strip, Lustro Gloss, 80# basis weight, manufactured by S.D. Warren, Westbrook, Maine.
3. Adhesive - Double faced Mounting Tape #518 made by Venture Tape Co., Rockland, MA.

Procedure

1. The foot of the plate guage is raised.
2. A swatch of printing blanket (approximately 1 1/2″ x 1 1/2″) is affixed to the base plate of the plate guage (printing surface upward) directly under the foot with the adhesive tape.
3. The end of the test strip is positioned directly below the test foot. (i.e. between the foot and the printing blanket).
4. The test foot is lowered; compressing the paper downward into the blanket.
5. After 30 seconds of compression, the foot is raised and the test strip is pulled horizontally until it releases. The release is measured as the force necessary to pull the test strip from the blanket surface, as measured with a hand held spring guage. (grams per square inch).

EXAMPLE

Method for Preparing Printing Blanket

A printing blanket is prepared as generlly outlined in the Example of U.S. Patent No. 4,303,721 to Rodriguez, issued December 1, 1981, incorporated in its entirety herein by reference, except that the surface rubber is dusted with talc and covered with a sheet of Stripkote VEZ-Supermat release paper prior to vulcanization. After vulcanization, the release paper is removed.

Claims

1. A printing blanket comprising a rubber outer layer having a printing surface suitable for carrying printing ink and having a perthometric roughness of from 4 to 25 μm, which surface is obtainable by steps comprising:
(a) covering an uncured rubber outer layer with a release sheet having a Gloss (60°) from 2 to 4 and a release from vulcanised rubber at 20°C of less than about 25 g/25mm;
(b) vulcanising the covered rubber surface; and
(c) removing the sheet to expose the printing surface.

2. A printing blanket according to claim 1, wherein the printing surface has a perthometric roughness of from 8 to 16 μm.

3. A printing blanket according to claim 1 or 2 obtainable by pre-coating the vulcanised rubber layer with a dusting material which is talc, mica, silica, or a mixture thereof.

4. A printing blanket according to claim 3 wherein the dusting material is talc.

5. A printing blanket according to any one of the pre-

ceding claims obtainable using a release sheet which comprises release paper.

6. A printing blanket according to any one of the preceding claims obtainable by using a release sheet which comprises a siliconate release agent coating.

7. A printing blanket according to any one of the preceding claims obtainable by applying the release sheet to a roll of printing blanket material under a tension of from 1400 to 28,000 kg./m^2, (2 to 40 psi).

8. A printing blanket according to any one of the preceding claims obtainable by using a release sheet having a Gloss (60°C) of about 3.

9. A printing blanket according to any one of the preceding claims obtainable using a release sheet having a release from vulcanised rubber at 20°C of less than about 8 g/25mm.

10. A printing blanket according to any one of the preceding claims having a tack of from 0 to 0.0124g/mm^2 (0 to 8 gsi).

11. A printing blanket according to any one of the preceding claims wherein the printing surface has a non-uniform random distribution of irregularly-shaped valleys spaced at an average of greater than two mean valley diameters apart.

12. A method of making a printing blanket as claimed in any one of the preceding claims which method comprises:

(a) covering an uncured rubber outer layer with a release sheet having a Gloss (60°) from 2 to 4 and a release from vulcanised rubber at 20°C less than about 20 g/25mm;

(b) vulcanising the paper covered rubber surface; and

(c) removing the sheet to expose the printing surface having a perthometric roughness of from 4 μm to 25 μm.

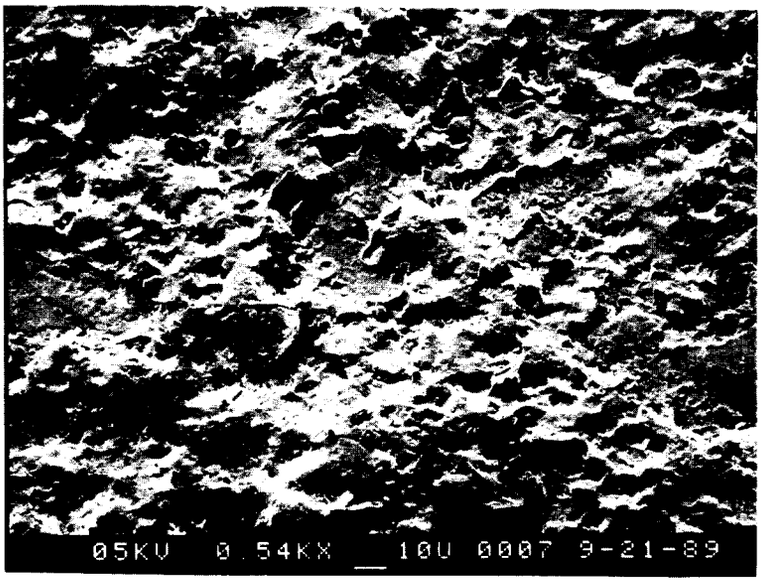

FIG. 1

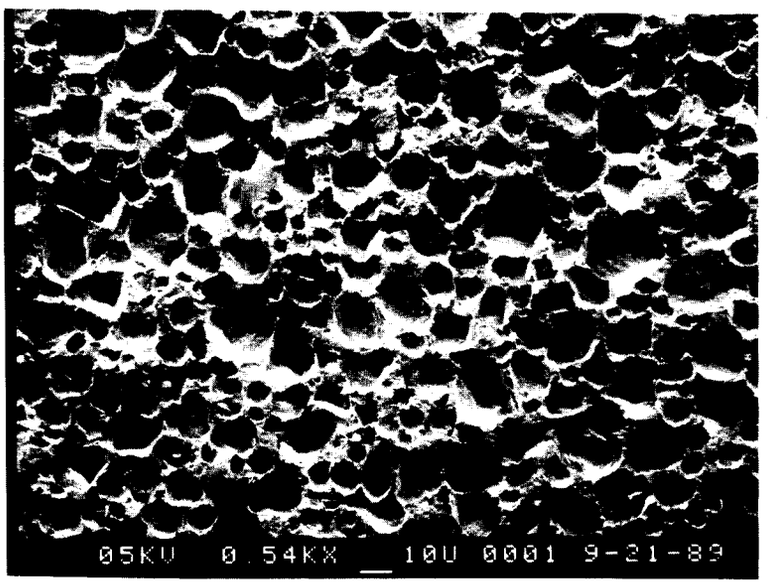

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 5875

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	PATENT ABSTRACTS OF JAPAN vol. 12, no. 218 (M-711)(3065) 22 June 1988, & JP-A-63 17093 (MEIJI RUBBER KASEI K.K.) 25 January 1988, * the whole document * ---	1-12	B41N10/02 B41N10/04
X	PATENT ABSTRACTS OF JAPAN vol. 12, no. 360 (M-746)(3207) 27 September 1988, & JP-A-63 116894 (KINYOUSHIYA K.K.) 25 May 1988, * the whole document * ---	1-12	
A	PATENT ABSTRACTS OF JAPAN vol. 13, no. 202 (M-824)(3550) 12 May 1989, & JP-A-1 22596 (FUJIKURA RUBBER LTD) 25 January 1989, * the whole document * ---	1	
A	PATENT ABSTRACTS OF JAPAN vol. 12, no. 87 (M-678)(2934) 19 March 1988, & JP-A-62 227792 (MEIJI RUBBER KASEI K.K.) 06 October 1987, * the whole document * ---	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5) B41N
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 200 (M-498)(2256) 12 July 1986, & JP-A-61 43596 (SUMITOMO RUBBER IND LTD) 03 March 1986, * the whole document * ---	1	
A	EP-A-360614 (W.R.GRACE & CO.) * abstract * -----	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 SEPTEMBER 1991	MARKHAM R.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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