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Kiener et al.

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[54] **DISPOSABLE BLANKET FOR PRINTING PRESSES**

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[58] **Field of Search** ..... 117/161 UD, 161 UN, 117/138.8 F, 155 UA, 138.8 E, 138.8 N, 138.8 UA, 138.8 R; 101/407 A

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[57] **ABSTRACT**

A disposable or throw-away blanket is provided for a conventional offset printing press. The blanket comprises inexpensive materials inexpensively assembled and can, therefore, be economically discarded after a run on a press. In one form, the blanket comprises a substrate, which may be a resinous film, and a coating on a substrate comprising in admixture an uncured, organic solvent-soluble rubber and synergistic co-fillers consisting essentially of carbon black and a hydrated, colloidal clay which impart ink-receptive and ink-release characteristics to the coating. Optionally, the coating may also contain a polyvinyl resin.

10 Claims, No Drawings

DISPOSABLE BLANKET FOR PRINTING PRESSES

BACKGROUND OF THE INVENTION

Rotary offset printing presses or duplicating machines conventionally employ cylinders covered with a rubber blanket. The usual blanket is about 60 to 70 mils in thickness and comprises a reinforced rubber. The blanket receives an image from a photographic master or other type of printing plate and reproduces the image on paper sheets fed through the press. It is necessary periodically to clean the blanket to remove ink in the image areas as well as to prevent an accumulation of sludge which otherwise would be transferred to the paper sheets.

Previously, the blanket has been cleaned either manually or by mechanical devices mounted on the press. Both practices require storage of flammable cleaning solvents which can be toxic and hazardous to operating personnel if due care is not observed in handling of the solvents. Further, manual cleaning necessitates stopping a printing machine, while the blanket is manually cleaned as by being wiped with a cloth moistened with a cleaning solvent. Moreover, manual cleaning is excessively slow, since only an accessible portion of a blanket can be cleaned at any one time. The blanket cylinder must be periodically rotated to expose a successively accessible area until the entire blanket has been cleaned.

As a result, various mechanical devices have been proposed to clean a rubber blanket while the press is in operation. One device uses an elongated web of absorbent material which is held against the surface of the printing cylinder by rolls or brushes. When the printing cylinder is rotated, a wiping action results between the web and cylinder to remove excess ink. In another device, a roll is used to supply a cylinder with liquid solvent which is thereafter removed with ink softened by the solvent by means of scraper blades or the like. These devices are insufficient in operation and not completely satisfactory.

U. S. Pat. No. Re 24,739 to Janke et al discloses a device for cleaning the offset or transfer surfaces of printing machines in which an absorbent, liquid-transferring material extends between a receptacle and a cleaning roll and serves to supply cleaning solvent to the roll from the receptacle. While this device operates quite effectively, it lacks the ability to reach full operating efficiency as rapidly as desirable and is somewhat sensitive to the level of cleaning solvent in the receptacle.

U. S. Pat. No. 3,422,758 to Brewster describes a blanket cleaner derived from that described by the cited Janke et al reissue patent. In this case, a wick also supplies a cleaning solvent from a reservoir to a cleaning roll which is adapted to contact and clean a blanket of a printing press. This wick is of improved configuration defining a short, direct, broad conducting path extending vertically between the body of a cleaning solvent and the cleaning roll. The wick comprises a special type of polyurethane sponge releasibly held in place for use or ready replacement. Although this wick results in improved operation, the upper contact surface of the wick tends in time to become coated with a sludge insoluble in the cleaning solvent. As a result, the effect of the scrub of the wick is reduced, and the flow of additional cleaning solvent to the cleaning roll may be interrupted.

It would, therefore, advance the art and simplify operation of a printing press if the need for cleaning the blanket, whether by manual or mechanical means, was entirely eliminated.

SUMMARY OF THE INVENTION

The present invention provides a blanket for an offset printing press or the like which performs well on the press and yet can be economically thrown away after use. When a press run is completed and the press is shut down, as for changing a lithographic plate or other printing plate, the present blanket can be removed at the same time and simply thrown away, thereby completely eliminating any blanket cleaning operation.

In one form, the disposable blanket comprises a substrate, preferably a flexible substrate such as paper or a resinous film, which carries a self-adhered coating or layer comprising in admixture an uncured, organic solvent-soluble rubber, like a butadiene-acrylonitrile copolymer, and synergistic co-fillers consisting essentially, based on the weight of the rubber from about 0.02 percent to about 25 percent of carbon black, and from about 1.5 percent to about 30 percent of a hydrated, colloidal clay like bentonite. Optionally, the coating may also include up to 50 percent by weight of the rubber of a polyvinyl resin.

In preparing the disposable blanket, the described components are preferably mixed with an organic solvent which solubilizes the uncured rubber. The hydrated clay is dispersed in the solubilized rubber. The substrate is coated with the mix after which the solvent is removed.

DESCRIPTION OF THE PREFFERRED EMBODIMENTS

To form an acceptable throw-away blanket, it is primary that the blanket must still satisfactorily meet performance requirements, such as acceptable ink-receptive and ink-releasing characteristics. That is, the blanket must have a natural receptivity to an ink such that an image transferred from a plate to a blanket is readily received and retained. However, the ink must not be absorbed to inhibit a proper print or split of the ink body to release of at least some of the ink when the blanket is pressed against a paper sheet to re-transfer the image to the sheet. Moreover, such ink-receptive and ink-releasing characteristics must be almost instantly exhibited by the throw-away blanket (as from the initial start-up) and throughout a press run.

Disposable or throw-away blankets by their nature cannot comprise expensive materials. To form an acceptable throw-away blanket it is also necessary not only that the materials forming the blanket are in themselves relatively inexpensive, but that the process of converting the materials to a blanket form likewise be relatively inexpensive.

It has been found that these difficult and somewhat contrary objectives are realized by a blanket comprising a substrate having a coating or layer comprising an uncured, organic solvent-soluble rubber and two co-fillers which together impart the desired ink-receptive and ink-releasing characteristics to the coating, both at the start of a press run and throughout the run, namely, carbon black and a hydrated colloidal clay used in conjunction with each other.

Considering initially the components of the disposable blanket, the substrate is preferably sufficiently

flexible to be wrapped around the blanket cylinder, and for this purpose may be fabricated from paper or a layer or film of a polymeric resinous material such as polyethylene, polypropylene, polyvinyl chloride, nylon, polystyrene, and the like. A preferred polymeric resinous material is a polyester like polyethylene terephthalate (sold under the trademark Mylar) because of its physical properties. The thickness of the substrate is not critical except that a thick hard substrate should have a thicker rubber coat than a softer or thinner substrate. It need be only thick enough to possess the requisite strength to resist tearing and the like under conditions of use. For most applications, a thickness of about 0.5 mil to about 4 mils sufficies.

The rubber component of the coating must be readily soluble or dispersable to facilitate preparation of a coating mix. Accordingly, the rubber must be unvulcanized and have a cured or polymeric growth which does not unduly inhibit its solvation in the solvent. This factor aids in realizing an inexpensive preparation of the blanket and requires, for example, minimal heating of the blanket after deposition of the coating material to remove the solvent. Different rubbers have different solubility characteristics to different solvents, but in general the present rubbers have a molecular weight range from about 20,000 to about 500,000, those of the lower molecular weights being preferred.

Natural rubber can be used, but more uniform results are obtained with the synthetic rubbers, such as polyisobutylene, polyisoprene, polybutadiene, butyl rubber (a copolymer of isobutylene and a conjugated diolefin), butadiene-styrene copolymers (Buna-S), and the like. Butadiene-acrylonitrile copolymers (sold under the trademarks Buna-N and Hycar) are preferred.

The two co-fillers, carbon black and hydrated colloidal clay, form a true synergistic addition to the rubber. The use of the carbon black or clay alone does not result in a disposable blanket of satisfactory performance. The presence of both the carbon black and clay is required. The carbon black provides a desired image density throughout a normal press run. The hydrated colloidal clay provides the necessary lithographic properties of acceptable ink pick-up, ink-receptivity, and ink-transfer. There is such good image definition with the present disposable blanket that often the first copy off a run is immediately usable since the print is clear, even, and free of fuzzy borders. The clay also appears to impart to the coating mixture a desired thixotropy property.

In general, the clay component comprises a plastic, soft, hydrated silicate of alumina. For example, kaolin, also known as China clay, may be used. Its formula is variously given as $H_2Al_2Si_2O_8 \cdot H_2O$ or $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$. Fire clay, pipe clay (which is similar to kaolin), and potter's clay (free of iron) may be used when hydrated, although they do not provide as good results as kaolin. A preferred clay is bentonite, a native, colloidal, hydrated aluminum silicate. Bentonite contains primarily the clay, montmorillonite, the formula of which has been given as: $(Mg \cdot Ca)\ O\text{–}Al_2O_3 \cdot 5SiO_2 n_2 H_2O$). One form of bentonite especially satisfactory is bentonite treated with organic bases and sold under the trademark BENTONE. In this bentonite, inorganic cations of the mineral lattice of the clay are replaced with organic cations.

The colloidal clays may be used in various particle sizes. As a rule, the sizes of the dry particles may range from about fairly coarse granules of four mesh to an extremely fine powder of less than 325 mesh or 44 microns. In one useful grade of Wyoming bentonite, from 65 to 75 per cent of the grains were finer than 0.2 micron and over 85 percent were finer than two microns. At complete hydration, the great majority of the particles are submicron in size. The specific gravity of dry bentonite is from about 2.3 to 2.9, depending in part on the degree of hydration and the sizing or grind which influences the packing of the particles.

In some applications, a polyvinyl resin is added to the coating mixture to provide more of a plastic body or matrix and to aid in ink pick-up and release. Such polyvinyl resins may be used as polyvinyl acetate, polyvinyl butyral, polyvinyl chloride, polyvinyl dichloride, and the like. Polyvinyl alcohol is not as satisfactory because of its water-solubility which causes poor ink receptivity.

With respect to proportions, based on the weight of the rubber, from about 0.02 percent to about 25 percent of carbon black and from about 1.5 percent to about 30 percent of the hydrated colloidal clay may be used. The lower amounts of these ranges provide sufficient quantities for the purposes described, while exceeding the upper amounts in these ranges results in waste with no attendant commensurate advantages. For most applications, the preferred ranges are from about 0.05 percent to about 5 percent of the carbon black and from about 5 percent to about 10 percent of the hydrated clay. When a polyvinyl resin is used, it may be present in an amount up to about 50 percent by weight of the rubber.

To prepare the present coating mix, it is necessary only to incorporate the rubber, carbon black, and clay (and a polyvinyl resin, if employed) in the proportions selected with a sufficient amount of an organic solvent to provide a mixture suitable for coating onto a substrate. Since the solvent is fugitive and removed after the coating step, the amount of solvent used is not at all critical. A sufficient quantity is normally employed to solubilize the rubber and form a consistency suitable for the manner of deposition selected. The coating mix may be deposited onto a substrate by any convenient means such as by roller or rod coating, doctor knife, and the like. After the deposition of the coating, the solvent is removed. This can be accomplished by permitting the solvent to evaporate at room temperatures or by slightly warming the coated substrate to hasten the volatilization of the solvent. The coating that is left self-adheres to the substrate.

The thickness of the coating is not at all critical except to compensate for substrate characteristics, as set forth above. Only enough of a continuous coating need be applied to perform the intended functions for the anticipated length of a press run. Thicker coatings may be used for longer press runs. For most applications, a coating thickness of about 0.5 mil to about 4 mils suffices, the total blanket thickness being from about 1 mil to about 8 mils.

The role of the solvent can be important in facilitating a quick dispersion of the colloidal clay, such that the process of making the blanket is simplified and shortened, again serving to reduce the overall cost of the blanket and making it economically feasible to throw away the blanket after use. Not only must the solvent solubilize the rubber readily, but preferably the solvent is poalr with respect to the colloidal clay. Under

these circumstances, the polar solvent improves the mixing action and, for reasons polar entirely clear, causes the collidal clay to form a suspension with the solvent system much more readily than it would otherwise. Preferably, the clay is conventionally milled in the presence of the solvent before admixing with the other components, although the clay and other components can be directly mixed with the solvent if desired. Mixtures of polar and non-polar solvents can be used.

As previously noted, bentonite comprises primarily the clay montmorillonite. The montmorillonite "flake" is anionic, that is, it carries a negative electrical charge. Usually these charges are balanced by cations or positively charged atoms which are external to the crystal. In Western-type bentonite found in Wyoming and the Dakotas, these cations are primarily sodium, so that the Western grades are sometimes called sodium bentonites or sodium montmorillonites. In Southern-type bentonites, the cations are primarily calcium, and these clays are generally referred to as calcium bentonites. It is possible that a charge on the montmorillonite "flake" reacts to the presence of a polar solvent in a manner enabling it to be more readily wetted by or dispersed in the coating mixture as described.

Solvents found useful in the present invention include 2-nitropropane, ethyl acetate, and especially those organic solvents containing a carbonyl group, such as acetone, methyl isobutyl ketone, and ethyl butyl ketone. Methyl ethyl ketone is preferred.

The following examples are intended to illustrate the invention and should not be construed as limiting the claims. Precentages are by weight unless otherwise indicated.

Example 1

A coating mixture was prepared consisting essentially of:

Butadiene-acrylonitrile copolymer (Hycar 1441)—20 grams
Hydrated colloidal bentonite (Bentone 27)—2 grams
Carbon black (Monsanto Lampblack 10C)—0.3 gram
Toluene—25 cc.
Methyl ethyl ketone—125 cc.

The components can be conventionally ball or roller milled separately or together to a desired particle size. The mixture was rod coated onto a plastic film of polyethylene terephthalate (Mylar) having a thickness of about 1 mil after which the solvents, toluene and methyl ethyl ketone, were evaporated to form the disposable blanket.

The blanket was mounted on a conventional offset printing press having an electrostatic master and ran as many as 500 copies without difficulty after which it was thrown away.

Example 2

A procedure was carrried out like the procedure of Example 1, exept that 2 grams of polyvinyl chloride were added to the coating mixture, and the substrate was light-weight Blue Crane base paper. The paper had a thickness of 0.85 mil and a coating that weighed 3/4 pound per ream. The resulting disposable blanket was used with a conventional offset printing press having a direct image master and ran as many as 500 copies without difficulty after which it was discarded.

Example 3

A procedure was carried out like the procedure of Example 1, except that the following formulation was used as the coating mixture:

Butadiene-acrylonitrile copolymer—20 grams
Hydrated colloidal bentonite—2 grams
Carbon black—1 gram
Methyl ethyl ketone—150 cc.

The admixture was applied by several sequential coating operations to form a final coating having a thickness of about 2.5 mils.

Example 4

A procedure was carried out like the procedure of Example 1, except that the following formulation was used:

Butadiene-acrylonitrile copolymer—20 grams
Hydrated colloidal bentonite—4 grams
Lamp black—2 grams
Methyl ethyl ketone—150 cc.

Example 5

A procedure was carried out like the procedure of Example 1, except that the following formulation was used:

Butadiene-acrylonitrile copolymer—100 grams
Hydrated colloidal bentonite—2 grams
Carbon black—5 grams
Methyl ethyl ketone—750 cc.

Example 6

A procedure was carried out like the procedure of Example 1, except that the following formulation was used:

Butadiene-acrylonitrile copolymer—100 grams
Hydrated colloidal bentonite—2 grams
Carbon black—25 grams
Methyl ethyl ketone—750 cc.

In place of the bentonite and the butadiene-acrylonitrile copolymer, any of the other clays and rubbers previously disclosed could, respectively, have been used.

The present invention provides a low cost, relatively thin disposable blanket for use with an offset printing press and the like. The blanket is made by an inexpensive process from inexpensive materials. It is not necessary to cure the rubber component of the coating of the present blanket. After a press run, the blanket may be stripped from its cylinder and thrown away. Meanwhile, there can be increased production of the press due to the complete elimination of a blanket.

What is claimed is:

1. A disposable blanket for offset printing presses comprising a substrate of polymeric material and a coating on the substrate comprising in admixture an uncured, organic-solvent soluble rubber with a molecular weight range of from about 20,000 to about 500,000 and synergistic co-fillers consisting essentially, based on the weight of the rubber, of from about 0.02 percent to about 25 percent of carbon black, and from about 1.5 percent to about 30 percent of hydrated, colloidal clay, said carbon black and hydrated clay imparting ink-receptive characteristics to the coating.

2. The disposable blanket of claim **1** in which said substrate is a flexible sheet.

3. The disposable blanket of claim **1** in which said substrate is paper.

4. The disposable blanket of claim **1** wherein the total thickness of said blanket is from about 1 mil to about 8 mils.

5. The disposable blanket of claim 1 in which said substrate has a thickness from about 0.1 mil to about 4 mils.

6. The disposable blanket of claim 1 in which said coating has a thickness of from about 0.5 mil to about 4 mils.

7. The disposable blanket of claim 1 in which said rubber is butadiene-acrylonitrile copolymer.

8. The disposable blanket of claim 1 in which said hydrated clay is bentonite.

9. The disposable blanket of claim 1 in which said co-fillers consist essentially, based on the weight of the rubber, from about 0.05 percent to about 5 percent of the carbon black, and from about 5 percent to about 10 percent of the hydrated clay.

10. The disposable blanket of claim 1 in which said coating includes up to 50 percent by weight of the rubber of a polyvinyl resin.

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