MULTI-PLY PRESS PACKING FOR THE IMPRESSION MEMBER IN A LETTER PRESS

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ABSTRACT

Rotary press blankets are made by laminating a highly porous, felted fibrous sheet impregnated with an elastomeric material with an impregnated, fine-count, substantially nonstretchable textile. The fibrous layers have a residual porosity at 4 mils compression of at least about 37 percent, and the entire blanket exhibits a firmness such that a pressure of at least about 10 pounds p.s.i. must be exerted on the blanket, to produce an initial compression of 2 mils.

7 Claims, 3 Drawing Figures
MULTI-PLY PRESS PACKING FOR THE IMPRESSION MEMBER IN A LETTER PRESS

This invention is concerned with blankets for printing presses, and especially with blankets which have improved compressibility and resilience.

Ry press printing requires a certain minimum pressure to transfer the ink from the type face or half-tone to the paper. This fact demands that the packing on the impression cylinder performs the function of pushing the paper into contact with the type face, and this in turn requires that the packing on the impression cylinder have some compressibility.

The same requirements hold in offset printing, for although there are no raised type faces or etched halftone dots, nevertheless, card stock and some papers vary enough in thickness over their extent to result in a spotty ink layout. Also, blankets often become embossed and do not produce an ink image in which the layoff of ink or color is uniform.

Customarily the impression cylinders are cut back approximately one-eighth to three-sixteenths of an inch so that a backing can be stretched around the impression cylinder and form a bed or cushion under the blanket. Frequently the press packing comprises three layers, e.g., the base blanket may be 0.050 of an inch thick. Over this a compressible layer formed of rubber-bonded cork some 0.064 of an inch thick is stretched, and the cork layer in turn is covered by a draw sheet or film paper which is about 0.026 of an inch in thickness. Other types of press packing use a cork-base blanket approximately 0.064 of an inch thick, and cover this with a draw sheet of sufficient thickness to build the packing up to about 0.147 of an inch.

In letter press printing, the electrotypes which are placed on the plate cylinder are made to have unform a printing face as possible. Nonetheless, there are differences. Some portions of the plate are higher than the others, and although this difference may be as little as fractional thousandths of an inch, the effect appears as a dropoff or change in the intensity of color which is laid down on the paper.

If, however, a blanket can be made which is truly compressible, then the very small differences in elevation of the printing face, together with differences in the thickness of the paper, and even slight differences in the thickness of the draw sheet, all of which in the absence of skillful make-ready normally cause defective printing, will practically disappear. Then a condition is brought about by which the paper is pressed against the type face with a substantially uniform pressure.

In theory, true compressibility plus complete recovery would greatly improve the quality of printing. The effect of but partial compressibility can be quite noticeable in the case of halftone dots, for if the press packing is rubber or a rubber-like substance which is distortable but not compressible a traveling wave is set up in the blanket. If the compressibility is severe, the halftone dots are distorted by the wave and assume a comma shape. With good compressibility the dots remain circular.

True compressibility has another important effect in high-speed presses. It reduces vibration and eliminates streakiness which are products of a pressing or a vibrating plate anchored on the plate cylinder may cause.

I have discovered that if a press packing is made from one or more layers of a compressible material laminated and firmly anchored to a substantially nonstretchable, thin fabric, the combined material will have the requisite compressibility to lay off a uniform ink image and will have very substantial life.

The compressible material which is suitable for use as the cushioning element in these novel press packings is made by impregnating a highly porous fibrous web with an elastomeric material in solution or in water dispersion, and subsequently curing the web under such conditions that a high degree of porosity is retained and permanent adhesion is secured.

The characteristic structure of the compressible layer is a fibrous web having a great multiplicity or very evenly distributed interconnected minute voids or air spaces which are surrounded by a tough, reinforced fiber-rubber structure. Consequently, the blanket, instead of developing a traveling wave rolling in advance of the line of pressure as is characteristic of blankets made of distortable but essentially incompressible materials (i.e., rubber), is merely displaced into the voids as the press rolls. It results that the traveling wave, in immediate advance of the line of pressure, either does not exist or becomes vanishingly small.

In consequence, the clarity of the impression is very much improved. It is an interesting result of this structure that a very uniform pressure is maintained on the plates or stereotypes, and since a true cushion is in existence, the damping effect of the cushion on press and plate motion is high. Vibrations are very materially reduced, and streakiness which is caused by a vibrating press or by a vibrating plate or stereo on the press, most often entirely disappears.

It is the object of this invention to produce press blankets suitable for use on letter presses and planographic printing presses which have the characteristics set forth above. These and other objects will become apparent from the specification and from the drawing in which FIGS. 1, 2, and 3 are enlarged fragmentary cross-sectional representations of the blanket showing the various laminae.

A very considerable amount of research effort directed to blanket structure and improved printing indicated that to produce an impression surface which was compressible but which restores itself so quickly that before the next impression is printed the blanket assumes its original flat surface condition, the void volume in the compressible areas of the blanket must be at least about 27 percent after the blanket has been compressed 4 mils in thickness. It also was shown that the blanket must possess a firmness or resistance to compression such that a pressure of at least 10 p.s.i. must be exerted on the blanket surface to effect an initial compression of 2 mils.

The layer which gives substantial tensile strength and allows the blanket to be stretched tightly around the impression cylinder is a substantially inextensible fabric. Light weight, fine count, cotton can be so treated as to become inextensible, but other fibers, particularly tensilized rayon, long-chain, cold-drawn high polymers, and hot-melt fibers such as polyethylene terephthalate are especially useful.

The compressible material is made by impregnating a fibrous web laid down either as a water-laid felt or an air-deposited felted structure. Excellent compressible laminae may be made from the foregoing materials.

Generally speaking, it is impractical to make the "laboratory samples" or short runs of laminated press blankets on a high-production machine such as a "Rotocure," but it is possible, in established conditions for "rotocuring," to determine what those conditions should be by conducting the laminating and assembly of the blanket in a conventional platen press. Short, experimental blankets were manufactured on the platen press. Blankets which were to be installed on high-speed, rotary news and magazine presses, and flat-bed color presses were cured on Rotocure apparatus. Platen press procedures will be reported since operating conditions are more simply and more accurately determined.

The spacing between the press platens is set by bearers which in this manner control both the thickness of the laminated structure and the amount of porosity. Multi- ply structures may be built up on this system. It is sometimes advantageous to incorporate an intermediate ply of the inextensible textile between any two compressible layers. The interply textile is, in such cases, coated on both sides or impregnated so that both faces present an adhesive surface.
EXAMPLE I

An impregnating felt having a ream weight of 182 lbs. and a density of about 4.5 was impregnated with a Buna-N latex until the weight of the rubber was 72 percent of the weight of the fabric. The felt was made from natural paper-making fibers consisting of 70 percent mercerized cotton linters and 30 percent short papermaking fibers having an average density of about 4. The impregnated sheet was then cemented to the working face, a fine-count, 80x80, tensiled rayon fabric, made by coating the fabric with a butadiene acrylonitrile copolymer latex adhesive, laying the fabric over the felt, and holding the assembly in a blanket press at 250° F. for 20 minutes. Press bearings were used to set the distance between the platens to 0.064 inch. The finished blanket was 0.064 inch in thickness and had an initial porosity of the compressive layer of 49.2 percent. Its residual porosity at 4 mils compression was 40.7 percent. The firmness of the compressive layer of the blanket was about 18 psi.

EXAMPLE IA

Four blankets of the above specifications, made however on “Rotocone” equipment, were installed and run for 4 months on one metropolitan daily newspaper. At the end of this time, printing was still satisfactory, but a press accident which tore one blanket caused the removal of all. Compressibility and thickness tests on the used blankets are reported in the following table.

| Table 1 |

<table>
<thead>
<tr>
<th>Sheet No.</th>
<th>Area</th>
<th>Mills Loss</th>
<th>At Ames thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Unprinted</td>
<td>1.0</td>
<td>66.65</td>
</tr>
<tr>
<td>2</td>
<td>Unprinted</td>
<td>0.9</td>
<td>66.9</td>
</tr>
<tr>
<td>4</td>
<td>Printed</td>
<td>1.1</td>
<td>66.2</td>
</tr>
<tr>
<td>2</td>
<td>Printed</td>
<td>0.4</td>
<td>64.9</td>
</tr>
<tr>
<td>1</td>
<td>Printed</td>
<td>0.9</td>
<td>65.6</td>
</tr>
</tbody>
</table>

Forty blankets so constructed were installed on the rolls of another metropolitan daily. At one point the paper web broke, and before the press could be stopped, 42 wraps of news print was wound around the cylinder. When the paper was removed, the blanket was found to be undamaged, and remained in service.

EXAMPLE II

The compressible member of this blanket was made from 115 lb. ream weight natural fiber paper consisting of 70 percent mercerized cotton linters and 30 percent of short paper-making fibers having a density of about 4. This was impregnated with a nitrite rubber latex modified with melamine resin. The amount of impregnant remaining in the sheet was 82 percent of the weight of the fiber. The inextensible layer was formed of a square weave 80x80 polyethylene terephthalate (Dacron) which was run though an impregnating bath. The whole assembly was then press-cured at 250° F. for 20 minutes, and had a final thickness of 0.0265 inch. The firmness was such that pressure of 13 psi was exerted to produce an initial compression of 2 mils. The residual porosity of the blanket was 46 percent.

The various structures which may be assembled to produce effective impression cylinder packings or impression blankets are illustrated in the accompanying figures.

FIG. 1, an enlarged fragmentary cross section of the improved blanket, shows the compressible layer, 13, interposed between the inextensible impregnated top layer, 11, and inextensible bottom layer, 12.

For presses requiring thicker blankets, multiple laminae may be used, as shown in FIG. 2, where the inextensible top layer, 11a, is superposed on a compressible felt, 12a, an intermediate inextensible layer, 14, a lower compressible layer, 13b, and a bottom, incompressible layer, 12b.

Packings which run on presses with shallow cutbacks are satisfactory if made with only two layers, as shown in FIG. 3, the incompressible layer, 11c, forming the top working surface, and the compressible layer, 13c, which in use lies directly on the impression cylinder.

The compressibility of the blanket is measured by determining the weight necessary to compress the blanket 2 mils in thickness. The residual compressibility is determined at the arbitrary amount of 4 mils reduction in thickness, at which the compressible base should retain 37 percent void volume.

Any of the fibers commonly now used to produce porous felted sheets with even formation may be used as the compressible material. Such fibers include the natural fibers of wool and cotton, and artificial fibers such as regenerated cellulose, nylon, and acrylonitrile, and vinylchloride copolymers. These may be used either singly or in combination. The felts may be formed either as water-laid felts by a standard papermaking procedure, or they may be air laid felt, provided that the air laid felt has low density and an even formation.

Any rubbery polymer in solution or in water suspension may be used as an impregnant, e.g., the impregnant may be natural rubber or any of the well-known synthetic rubbers such as the isoprene or butadiene polymers and copolymers, polysulfide rubbers, or the polyacrylates. These substances must be vulcanized or cured or combined with a resinous material—phenolic, urea, melamine, and epoxy resins are the most satisfactory modifying substances. The amount of resin depends on the nature of the rubbery polymer and the degree of toughness which is desired, but the amount of resin should never exceed that which destroys the rubbery characteristics of the polymer.

Although considerable latitude is permitted in the addition of resin, the amount of resin will not exceed 30 percent of the weight of the rubbery polymer. The amount of the impregnant to be used is determined by the porosity and the resilience which is desired in the impregnated sheet. Effective results will be secured when the weight percent of solid impregnant based on the weight of the dry fibrous component is 50 percent, but considerably higher proportions of impregnant are ordinarily employed and will add strength and durability to the sheet. The upper limit of impregnant is that which destroys the necessary 37 percent of porosity. I have used as much as 140 percent of impregnant, cured the sheet under light pressure, and have maintained the residual porosity of sheets so impregnated above the critical level of 37 percent.

Within these limits, excellent press packings are produced. Since these packings are most convenient when made in the form of a blanket which may be tightly stretched around the impression cylinder, the word "blanket" is used and is synonymous with the expression "packing."

Although square weave, fine-count, inextensible fabrics are usually preferred, smooth weaves such as stain weaves also make excellent working surfaces. They are covered with adhesive stretched over the compressible material and handled in exactly the same way as a square woven textile.

The combination of compressibility as distinguished from mere distortability, plus the strength and inextensibility which characterizes this product, makes it possible to tension the blanket tightly with the rolls which are usually associated with the impression cylinder. When pulled tightly about the cylinder, these blankets give phenomenal longevity. They maintain excellent printability—very much longer than combinations of packing and draw sheets—one very notable advantage being that even toward the end of very long runs there
is no tendency for any separation or creep. This is frequently the cause of poor press work in the combination of packing and draw sheets of the prior art.

As used in the claims, the word "rubber" is intended to include natural rubber and elastomeric polymers—popularly called "rubber"—such as, for example, the impregnating and adhesive materials disclosed in the foregoing specification.

I claim:

1. A multi-ply press packing for the impression member in a letter press comprising a laminate having:

- an upper surface lamination formed of an elastomer-impregnated woven textile;
- a lower surface lamination of said elastomer-impregnated woven textile; and
- intermediate of said upper and lower surface laminations, a layer of highly porous, resilient, compressible, felted fibrous material impregnated with an elastomer, the impregnated felted fibrous material having a firmness such that a pressure of at least 10 p.s.i. must be exerted on the material to effect an initial compression of 2 mils and a residual porosity at 4 mils compression of at least about 37 percent.

2. The packing of claim 1 wherein said woven textile is selected from the group consisting of cotton, tencilsized rayon, long-chain, cold-drawn high polymers and polyethylene terephthalate.

3. A multi-ply press packing for the impression member in a letter press comprising a unitary built-up laminate having the following structure:

- a bottom surface lamination formed of an elastomer-impregnated woven textile;
- an upper surface lamination formed of an elastomer-impregnated woven textile;
- a third, middle lamination of an elastomer-impregnated woven textile situated between said bottom surface and said upper surface laminations;
- a first layer of a highly porous, resilient, compressible, felted fibrous material intermediate of said bottom surface lamination and said third middle lamination and heat and pressure laminated thereto, said felted fibrous material being impregnated with an elastomer and having a firmness such that a pressure of at least 10 p.s.i. must be exerted on the impregnated felted material to effect an initial compression of 2 mils, and a residual porosity at 4 mils compression of at least about 37 percent; and
- a second layer of said elastomer-impregnated, porous, resilient, compressible felted fibrous material intermediate of said upper surface lamination and said third middle lamination of impregnated woven textile and heat and pressure laminated thereto.

4. In a letter press printing operation wherein the image-receiving member is pressed against raised type faces by an incompressible roll having as its surface covering a draw sheet, and intermediate said incompressible roll and said draw sheet, a compressible layer of press packing, that improvement which comprises providing as said press packing a laminate of

- a base layer of vibration-absorbing, resilient, compressible, elastomer-impregnated felt having a firmness such that a pressure of at least 10 p.s.i. must be exerted to produce an initial compression in the said base layer of 2 mils and having a residual porosity at 4 mils compression of at least about 37 percent; and
- an upper textile layer formed from fibers selected from the class consisting of cotton, tencilsized rayon, long-chain, cold-drawn high polymers, and polyethylene terephthalate, said textile layer being impregnated with an elastomer, and said laminate being positioned upon said incompressible roll such that said textile layer is adjacent said draw sheet.

5. In a letter press printing operation wherein the image-receiving member is pressed against raised type faces by an incompressible roll having as its surface covering a draw sheet, and intermediate said roll and said draw sheet, a compressible layer of press packing, that improvement which comprises providing as said press packing, a laminate of

- a base layer of vibration-absorbing, resilient, compressible, elastomer-impregnated felt having a firmness such that a pressure of at least 10 p.s.i. must be exerted to produce an initial compression in the said base layer of 2 mils and having a residual porosity at 4 mils compression of at least about 37 percent, and
- elastomer-impregnated layers of woven fabric covering both faces of said felt and united to said felt to form a unitary structure.

6. In a letter press printing operation wherein the image-receiving member is pressed against raised type faces by an incompressible roll having as its surface covering a draw sheet and intermediate said roll and said draw sheet, a compressible layer of press packing, that improvement which comprises providing as said press packing, a unitary, built-up, multi-ply laminate comprising a plurality of vibration absorbing resilient, compressible elastomer-impregnated felted sheets having a firmness such that a pressure of at least 10 p.s.i. must be exerted to produce an initial compression in the said felted sheet of 2 mils, and having a residual porosity at 4 mils compression of at least about 37 percent, and an elastomer-impregnated textile layer formed from a material selected from the class consisting of cotton, tencilsized rayon, long-chain, cold-drawn high polymers, and polyethylene terephthalate, united to the upper and lower surfaces of each of the constituent felted sheets.

7. In a letter press printing operation wherein the image-receiving member is pressed against raised type faces by an incompressible roll having as its surface covering a draw sheet, and intermediate said incompressible roll and said draw sheet, a compressible layer of press packing, that improvement which comprises providing as the press packing a laminate of

- a base layer of vibration-absorbing, resilient, compressible, elastomer-impregnated felt having a firmness such that a pressure of at least 10 p.s.i. must be exerted to produce an initial compression in the said layer of 2 mils, and having a residual porosity at 4 mils compression of at least about 37 percent, and
- an upper textile layer comprising elastomer-impregnated polyethylene terephthalate united to said felt to form a unitary structure, said laminate being positioned upon said incompressible roll such that said textile layer is adjacent said draw sheet.
Disclaimer


Hereby enters this disclaimer to all claims of said patent.

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