Aug. 27, 1957 B. S. CROSS ET AL 2,804,417

PRINTING ACCESSORY

Filed Jan. 13, 1947

Fig. 1

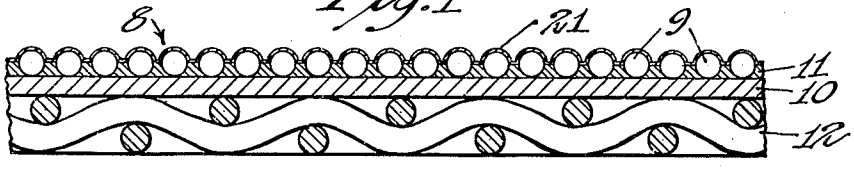


Fig. 2

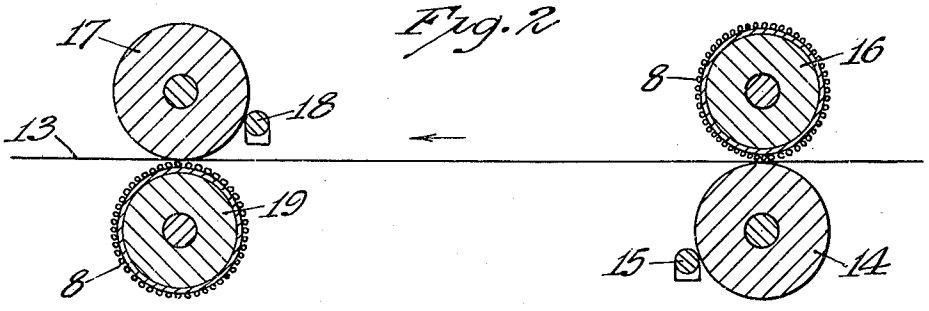


Fig. 3

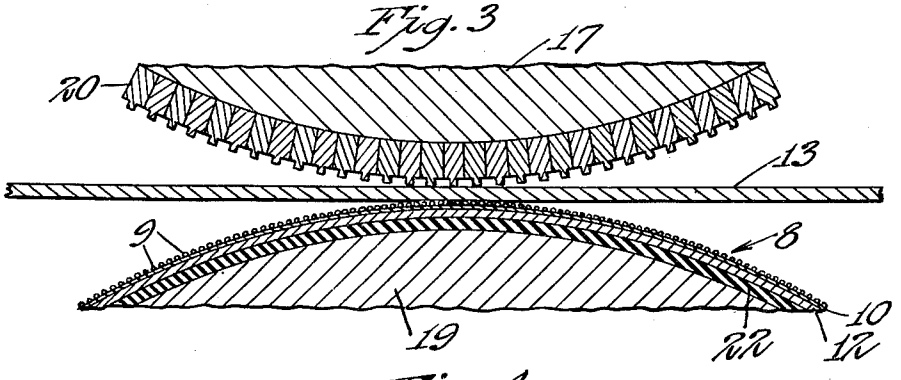


Fig. 4

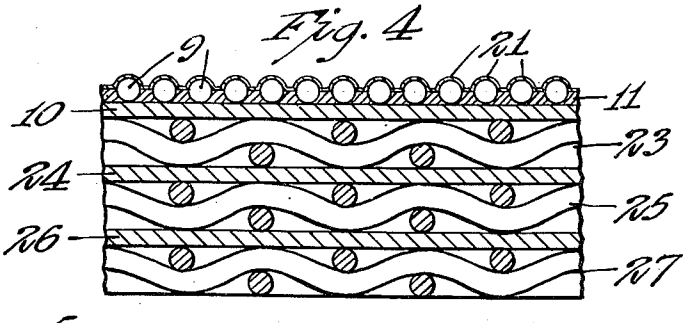
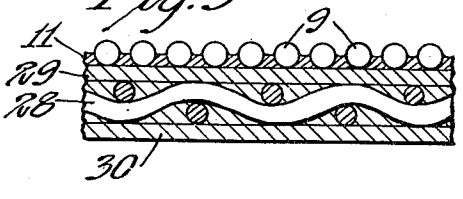


Fig. 5



Inventors

Bert S. Cross

Melvin L. Gebhard

By Carpenter, Abbott, Coulter & Kinney

Attorneys

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2,804,417

PRINTING ACCESSORY

Bert S. Cross and Melvin L. Gebhard, St. Paul, Minn., assignors to Minnesota Mining & Manufacturing Company, St. Paul, Minn., a corporation of Delaware

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1 Claim. (Cl. 154—54.5)

This invention relates to printing accessories and particularly to draw sheets, blankets or the top cover of impression cylinders employed in letterpress printing. The invention has particular utility in perfecting presses, which include the high speed rotary presses upon which metropolitan newspapers are printed. In letterpress printing, the printing pressure is developed by compression of the paper to be printed upon, held between rigid surfaces which are maintained apart at predetermined distances. Pressure is required to transfer ink satisfactorily from the printing surface to the paper to be printed. In perfecting presses, this pressure is partially supplied by packing secured to the circumference of the impression cylinders of the press. The packing on the impression cylinder of rotary newspaper presses is approximately .160 inch to .190 inch in thickness. It usually comprises "underpacking" which is tightly wrapped around the impression cylinder making up the bulk of the clearance and a top cover, usually called a draw sheet or blanket.

In newspaper rotary presses the packing employed usually is one of two types. For example, a heavy blanket comprising three or more layers of rubber and fabric is secured over a lamination of rubber or cork underpacking. The blanket is usually .080 inch to .092 inch thick. Another packing for newspaper rotary presses includes two layers of cork or rubber as the underpacking and a top cover, called a draw sheet consisting of a highly vulcanized synthetic rubber laminated to fabric. In this construction the draw sheets are thinner than the blankets previously mentioned and are from .024 inch to .030 inch thick. A further draw sheet comprises cloth having a coating of compressible rubber or resin cups.

Blankets and draw sheets of the type described do not prevent or reduce "offset" in any substantial measure. "Offset" has been described as the tendency of undried ink to transfer from a freshly printed sheet to any other surface with which it comes in contact, particularly the blanket, draw sheet or tympan sheet on the second impression cylinder, and to retransfer back to the printed sheet. Rotary perfecting presses include two units or couples and each unit is composed of a plate cylinder and an impression cylinder. In order to print upon both sides of the paper in a single printing operation, in one unit the plate cylinder is under the impression cylinder and in the other unit the plate cylinder is over the impression cylinder and the paper web moves rapidly from one printing couple to the other. The operation of rotary presses is conducted so rapidly that the ink applied to the paper in the first pair of cylinders does not dry before the other surface of the paper web is printed in the second pair of cylinders. In modern newspaper presses in which the paper web may travel at speeds of 1500 feet per minute, only a fraction of a second intervenes between the first and second printing impressions. Since newspaper printing inks dry by absorption of the vehicle into the paper, it is obviously impossible to dry the ink in

the short time interval between the first and second printings of the two sides of the web. As a result some of the wet ink from the first impression printing is transferred or offset onto the surface of the blanket or draw sheet on the second impression cylinders. Wet ink accumulates rapidly on the surface of the top sheet of the second impression cylinder and after a number of printing impressions a state of equilibrium is reached in which the ink is retransferred from the top cover surface to the already printed side of the web in the pattern of the pressure applied during the second printing. Thus the quality of the first impression printing is impaired. For example, type matter of the second impression printing may appear on half tone reproductions of the first impression printing and mars the appearance of the half tone. The quality of the first impression printing is further damaged by the fact that it is impossible to keep the web "tracking" accurately so that each printed page will register exactly with the ink offset onto the top cover by previous impressions. As a result substantially the entire circumference of the draw sheet or blanket becomes lightly coated with wet ink.

This problem is further aggravated in newspaper presses, which do not employ "make-ready," due to the fact that time is of the essence in producing newspapers. "Make-ready" is the expression employed for altering the surface of the support for the material to be printed in order to compensate for mechanical inaccuracies in the printing surfaces and to obtain increased printing pressure for such areas as may require it. Since it is a custom job and requires several proof printings, it is obviously time-consuming and costly, and hence is not employed in newspaper printing. Thus in order to compensate for the inaccuracies in the printing surface and in order to print low areas in the printing surface, a resilient packing is required on the impression cylinders of newspaper rotary presses by the nature of the hard squeeze which is imparted to print the entire stereotype.

Differences of up to .006 inch in the surface level is frequent on stereotype faces. Thus the absence of make-ready tends to aggravate offset and to emphasize the need of a hard-surfaced packing resiliently supported.

Furthermore, smearing or blurring of the first impression printing frequently occurs due to slippage of the paper web between the cylinders of the second printing couple. This may be caused if the plate and impression cylinders are not of the same circumference or by movement of the stereotypes on the plate cylinders by centrifugal force at normal high speeds of rotation. The problem is frequently aggravated, when soft packing is employed, by slight piling up of the draw sheet in advance of the linear width of the web being printed.

Various expedients have been unsuccessfully tried by the printing industry over a period of many years to overcome the problem of first impression offset. For example, liquids and powders have been sprayed upon the freshly printed web to facilitate the drying of the ink or to cover it during its travel over the second impression cylinder. Special dryers have been incorporated in inks and the ink has been heated to hasten the drying. Modifying the tension on the web as it is drawn through the press also proved to be unsuccessful. The use of various materials having smooth, non-porous or ink-repellent surfaces, such as "cellophane" or mercury-coated materials likewise were unsuccessful in that they did not withstand the hard usage of long printing runs. Steel and hard rubber surfaces on the impression cylinder did not provide the answer as they did not have the necessary resiliency to absorb high spots on the printing surface to permit the remainder of the type to make an adequate printing contact with the paper web being printed.

Since it takes time to replace the draw sheet or blanket on the impression cylinder, as it is retained thereon by clamps or pins and a reel member, and as previously mentioned, time is of the essence in modern newspaper and magazine production, it is essential that the top sheet or blanket be exceedingly strong and durable. In fact a satisfactory draw sheet or blanket for newsprint presses must last for approximately 10 to 15 million printing impressions under high speed operation, in which as high as 6 revolutions or printing impressions per second may be made.

It is also necessary that the top cover be oil-resistant in orer to avoid swelling of the draw sheet from the ink vehicle or from cleaners, which would result in inaccurate printing and premature disintegration of the top cover sheet.

We have found that a blanket or draw sheet having highly satisfactory properties, particularly in respect to very material reduction of first impression offset, may be provided by presenting a hard, discontinuous, planar surface supported by a durable and resilient backing material. A single layer of minute spherical or spheroidal bodies of substantially uniform diameter have been found to have the requisite strength, hardness and surface characteristics of a draw sheet or blanket and to produce even printing on presses which do not employ make-ready. These bodies are securely bonded individually to a strong, resilient and flexible backing, leaving half or somewhat less than half the diameter of each body projecting for contact with the freshly printed web. The backing comprises a tough, resilient shear-resistant fabric or paper. An adhesive is employed which is not only resilient and resistant to impact but also has strong adhesion to the spherical bodies and to the backing. The spherical beads or bodies are submerged in the adhesive to a depth of not less than half their diameter in order that a socket covering from 50 to 75 percent of the bead area is formed by the adhesive coat. A sheet adapted to withstand the rough usage as a top cover on the impression cylinder of newspaper presses is obtained if the beads are submerged to about 60 percent of their surface in the adhesive.

To obtain most satisfactory results in newspaper presses, the improved draw sheet or blanket preferably has a resilient or cushioning layer interposed between the fabric backing and the beads. As will be brought out in greater detail, the desired resilience may be obtained by employing a thicker layer of adhesive, or, as is preferred, a separate cushioning layer or layers may be employed, intermediate the beads and the fabric backing or upon the outer surface of the fabric backing.

Glass beads provide the required hard face necessary to obtain accurate printing. For example, beads formed from a lime soda glass, such as that commonly used in the construction of glass containers and window panes are very suitable. However, since the optical characteristics of the material are not involved, the beads may be formed from iron, steel or other metals or alloys, or from ceramic material, rubber or synthetic resins having the required hardness and durability.

Inexpensive methods of forming spheroidal beads of adequate strength are well-known to those skilled in this art.

As previously pointed out the backing of the draw sheet or blanket must withstand long hard usage. Accordingly fabric materials are preferably employed. For example, a straight-laid, square-woven fabric such as kier-boiled drills comprising 1.97 yards per pound has been found to be satisfactory. Other sheet materials, such as vulcanized or hydrolized fibre, tough glass fibre sheets and certain paper which is resilient and is not permanently deformed under pressure, as paper impregnated with rubbery material, may be employed. A fairly high degree of compressibility and resiliency is desirable in the backing to allow the bead-coated material as a whole to be temporarily compressed under locally applied pressure to compensate for ordinary inequalities in the type face level or slight inaccuracies in the cylinder face. Thus the backing member may comprise open-mesh fabric coated on both surfaces with rubbery material which extends through the meshes to form a unitary member.

It is to be understood that the spheroidal or globular bodies constituting the facing of our improved draw sheet or blanket are herein sometimes called beads for convenience of reference only and not to limit the subject matter to conventional bead sizes or materials which are designed to produce various optical or ornamental effects.

The point contact support of the material to be printed upon, afforded by our minute, hard, spherical members, has been found to reduce very materially, or to eliminate, first impression offset and smearing or blurring of the first impression printing even when slippage of the web occurs during second impression printing.

Furthermore, greatly improved printing has been obtained by employing draw sheets or blankets of the type described in that the improved beaded product possesses the proper amount of firmness or surface hardness which results in faithful reproduction of half tones, sharp clear type areas and uniform and complete coverage of solids. In printing half tone dots on a paper web supported against a soft rubber top sheet of the conventional type, the stereotype frequently forces the paper web into the rubber and prints the side or shoulders of the half tone dots in addition to the surface portion, producing distorted dots and a poor reproduction of the half tone. The beaded, discontinuous, planar surface of our improved top sheet accurately prints only the surface of the stereotype since protruding portions of the stereotype cannot force the paper into the hard top sheet. Under printing pressure the beads may be compressed into the cushioning layer without permitting the printing of the type edges and shoulders upon the paper web. Thus discrepancies in the height of the stereotype, which occasionally approximate .006 inch error, are readily absorbed in our improved construction by compressing the beads into the resilient bead bond, cushioning underlay and backing.

"Leaders" or rule lines, set in stereotypes to print coupon edges or dotted lines, do not damage our improved draw sheet or permanently emboss it as is customary when printing against a rubber blanket or draw sheet. Our draw sheet presents a hard surface which is not cut or embossed by the sharp leaders and thus eliminates reproduction of the previous pattern on subsequent printing with the same draw sheet, which is called "ghosting."

Likewise our improved draw sheets show no permanent embossing even after having been subjected to the compression of several million printing impressions. The resiliently supported beads return immediately to their former planar contour after each impression and the sheet may be reused on many different printing operations. One serious difficulty with rubber, cork and other deformable draw sheets of the art is that after supporting a great number of printing impressions of the same outline, this outline becomes permanently embossed on the surface of the sheet rendering it unusable in supporting printing impressions of a different outline, since it will subsequently "ghost" the prior outline onto the paper web. Printing impressions numbering many millions have been made upon our resilient, beaded draw sheets without producing objectionable embossing.

Tests aggregating ten millions of impressions on a single beaded draw sheet in a high speed rotary newspaper press demonstrate that our improved draw sheet or blanket materially reduces or eliminates first impression offset. A draw sheet has been produced which for the first time permits printing first impression signatures which closely approach second impression printing in quality. This result is achieved, first by reason of the

fact that ink adheres much less readily to glass beads than to rubber employed in commercial draw sheets. Secondly by presenting a multitude of minute, hard, discontinuous surfaces, the undried ink on the web does not tend to transfer to our draw sheet which does not present a continuous surface upon which small pools of ink may form due to surface tension. The exceedingly small quantities of ink that may be transferred to the draw sheet are forced into the interstices between the beads and thus absorption of ink by the paper web on subsequent impressions is avoided. A further advantage of our draw sheet is that it requires little or no cleaning. Some draw sheets have run upwardly of 4½ million impressions without requiring washing.

As previously set forth the support or backing for the beaded draw sheet facing, in order to perform satisfactorily on newspaper rotary or flat bed presses, where "make-ready" is not employed, should be sufficiently resilient and temporarily compressible to absorb the compression of the beaded surface when printing from uneven stereotypes as frequently occurs in printing newspapers. The use of our improved draw sheet is not limited to presses which do not employ "make-ready," as it also has considerable utility in so-called "hard pack" presses which uniformly employ make-ready. The use of our improved draw sheet on newspaper presses has been emphasized herein since such usage presents the most exacting requirements of draw sheets, blankets or tympan sheets. The support must also be tough, tear-resistant and relatively fatigue-resistant to stand up under approximately 10 million or more printing impressions. Accordingly a straight-laid square woven fabric is preferably employed as the base member since it is more resistant to permanent deformation than most papers or other felted materials.

To obtain the desired resilience, a cushioning layer is preferably interposed between the base member and the beaded surface; or, if desired, it may be coated upon the outer surface of the base member. The cushioning layer is preferably formed of elastic polymers with or without adhesion-inducing agents and is sufficiently tough and resilient to resist yieldingly and absorb partially the localized, temporary depression of the spherical beads, when subjected to printing pressure. To provide this resiliency the cushioning layer preferably has a Shore hardness of 50 to 75, although satisfactory cushioning layers may be made with a Shore hardness varying from 30 to 90. Mixtures of synthetic and natural rubber, highly cured, provide a satisfactory cushion coat, as they adhere very well to fabric and paper backing and will not strip off in use. Such mixtures preferably contain resins to obtain firm adhesion to the fabric base member and to the bond for the spherical bodies. The cushioning layer may comprise a thermosetting or thermoplastic resin or mixtures thereof, such as Vinylites, acrylates, silicones and the like. Glue-glycerine compositions may also be used.

A highly satisfactory cushioning coat has been formed of a rubbery butadiene-acrylonitrile polymer and a phenolic adhesion-inducing agent. This cushioning composition may be formed in accordance with the following formula, in which the parts are set forth by weight.

Example 1

	Parts by weight
Rubbery butadiene-acrylonitrile polymer	100
Compatible heat-reactive phenolic resin	75
Plasticizer	17
Pigment (carbon black)	5

In the above example, the polymer employed was a copolymer of 55 parts of butadiene and 45 parts of acrylonitrile. "Hycar OR–15," a product of the B. F. Goodrich Chemical Co. of Cleveland, Ohio, is substantially of this composition and has given good results. Variations both in ratio and identity of monomers which produce analogous copolymers are contemplated. For example, a copolymer of 55 parts of butadiene and 45 parts of methacrylonitrile has been successfully employed in these compositions, as has a copolymer of 60 parts butadiene and 40 parts acrylonitrile.

"Durez 175" resin, a product of Durez Plastics and Chemicals, Inc., North Tonawanda, New York, is a commercially available resin which has given good results when used in the formula of Example 1; it is soluble in methyl ethyl ketone, insoluble in benzene, has a temporary melting point of 85° C., and is understood to be the reaction product obtained from phenol, acetaldehyde and formaldehyde in the approximate molar ratio of 1.0:0.25:0.95. Another commercial resin which is equally effective is "Varcum 5476" resin, a product of Varcum Chemical Corp., Niagara Falls, New York.

Dioctyl phthalate is one example of a plasticizer which has given good results in formulas such as that of Examples 1–3; dibutyl sebacate, tributoxy ethyl phosphate, or other analogous plasticizers, may, however, be substituted therefor in whole or in part.

The cushioning layer of Example 1 may be compounded in a rubber mill. The rubbery polymer is milled for approximately 15 minutes and then the plasticizer and carbon black or other filler are slowly added. Finally, the finely crushed resin is added rapidly. The cushioning layer may be applied to the fabric base by means of a 3-roll calender. The calender roll temperatures, pressure and speed are adjusted to provide essentially a surface coating of the composition on the fabric, with only minor penetration. In forming a draw sheet .026 inch thick the intermediate cushioning layer is approximately .008 inch thick. In this construction the fabric backing may be approximately .015 inch and the beads approximately .003 inch. To obtain a thinner draw sheet of approximately .020 inch, such as is suitable for use on Duplex and Goss Comet flat bed presses, the cushioning layer may be .002 inch thick.

The cushioning layer of Example 1 may also be applied to the fabric by a transfer coating method in which the solution is knife-coated on a carrier web, the adhesive content is tackified by heating and the material is then transferred to the fabric base at nip rolls. In this case the composition is formed by first milling the polymer and then dissolving it in a suitable solvent such as hexone and subsequently dissolving and adding the resin content. The plasticizer and pigment, in a dispersed form, are then added and mixed thoroughly. 362 parts of hexone may be employed with the composition shown in Example 1. After the cushioning layer has dried the carrier web may be stripped from the fabric, which as previously mentioned may comprise a kier-boiled drills cloth. The cushioning layer is coated on the fabric in such manner that 24 square inches of it weighs 60 grains, when dry, in the .026 inch thick draw sheet.

A cushioning layer having the desired resiliency and durability may also be prepared in accordance with the following formula.

Example 2

	Parts by weight
Rubbery butadiene-acrylonitrile polymer	100
Compatible coumarone-indene resin	10
Zinc oxide	5
Stearic acid	1
Plasticizer	10
Filler (semi reinforcing carbon black)	120
Sulfur	1.25
Primary accelerator	1
Secondary vulcanizer	0.75

The composition of Example 2 may be prepared and calendered or coated on the backing member in the manner described in connection with Example 1. The composition is then heated to obtain a tight cure. Likewise the butadiene-acrylonitrile polymer and the plasticizer

may be the same as those described in connection with Example 1. The primary accelerator may comprise 2-mercapto benzothiazole, such as sold by the Vanderbilt Company under the trademark "Captax." The secondary vulcanizer may comprise zinc diethyl dithiocarbamate.

A satisfactory cushioning layer which does not employ an adhesion-inducing resin is shown in the following formula.

Example 3

	Parts by weight
Natural rubber-smoked sheets	100
Zinc oxide	5
Stearic acid	1
Antioxidant	1
Filler (medium process channel black)	40
Delayed accelerator	0.25
Primary accelerator	0.75
Sulfur	3

The antioxidant may comprise phenyl alpha naphthylamine. The delayed accelerator may be 2,2-benzothiazyl disulfide. This formula may be compounded in a rubber mill as described in connection with Example 1 and then calendered or coated upon the backing member. It is heated to obtain a tight cure.

The foregoing examples are illustrative only and other compositions having the desired resiliency, durometer hardness, adhesion properties and tensile strength will be apparent. For example a cushioning layer employing as a basic ingredient "neoprene" (polychloroprene), "Thiokol" (a sulphur-olefin resin), buna type rubbers, plasticized polyvinyl chlorides, butyrals or silicone rubbers is contemplated. Likewise the types and proportions of resins, plasticizers, fillers, vulcanizers, etc. in the foregoing examples may be modified somewhat without appreciably altering the desired physical properties, previously enumerated, of the cushioning layer.

The beads are secured to the cushioning layer by a tough, resilient and flexible bonding composition which has a high and permanent adhesion to the beads. It has been found that the combination of properties required in an adhesive suitable for bonding beads to the cushioning layer, cured on the fabric backing, in producing draw sheets or blankets adapted for the rough usage encountered in newspaper presses, is obtainable with certain compounds comprising elastic polymers and adhesion-inducing agents. The rubbery butadiene-acrylonitrile polymer and an adhesion-inducing agent of Example 1, dissolved in an organic solvent, e. g. methyl isobutyl ketone, to a coatable viscosity, such as 14,000 centipoises at room temperature, provides an excellent bonding composition for glass beads and has the desired resiliency to withstand temporary deformation of the planar beaded surface under printing pressures.

The beads may be coated upon the composite backing in accordance with methods which have been employed in the manufacture of coated abrasive material. For example, the small spheres may be sprinkled or spread upon the adhesive coated web by gravity, the excess spheres being then removed. Before the adhesive has set, the coated web is passed between accurately spaced nip rolls which level the tops of the spheres and submerge them to the required depth in the adhesive, preferably over 50% of area of the spheres. The beaded product is then partly cured by heating and a second or sizing coat may then be spread over the spheres in order to more firmly secure them to the flexible backing or to impart a surface which will reduce any tendency of the ink or other substances encountered in a particular use to adhere to the beaded material. The composition of Example 1, when completely cured, has high ink-repellent properties and may be applied as the size coating in a solution comprising two parts of Example 1 and 1 part solvent, e. g. hexone. The sizing coating is of molecular thickness on the surface of the beads and may be applied by means of a roll partially immersed and revolving in a pan of sizing solution and contacting with the beaded coated surface of the web, or by spraying with a sizing solution, or by any other suitable means. The beaded product may then again be passed through the spaced nip rolls and is again heated to obtain a fully cured bond. Employing the bonding composition and size solution of Example 1, as described, a bonding composition which has a high and permanent adhesion to glass beads is obtained if the partial cures and final cure is equivalent to a draft oven cure of fourteen hours at 250° F.

A bonding coating weighing eight grains (dry weight) per 24 square inches is adequate. If, as is preferred, the cushioning layer, bead bond and size coat are formed from the composition of Example 1, it is apparent that the laminations have high cohesive values and that it would be very difficult to strip the layers from each other. It will also be apparent that by employing a slightly thicker cushioning layer, the adhesive layer per se may be omitted. For example the surface of the cushioning layer may be rendered adhesive by applying a solvent thereto, the beads sprinkled on the adhesive surface; the beaded composite is then passed through nip rolls and heat cured. This modification is not preferred since it is difficult to obtain a substantially planar beaded surface, as it is difficult to control accurately the degree of submergence of the beads in the combined bonding and cushioning layer.

Example 4

Another suitable bead bonding composition may comprise 10 parts of polychloroprene ("Neoprene CG"), 15 parts of compatible oil-soluble heat-reactive phenol-aldehyde resin ("Bakelite 3360"), 5 parts of dioctyl phthalate, 0.5 part zinc oxide, and 0.4 part magnesium oxide, dissolved to desired viscosity in butyl acetate. This composition may be coated on the cushioning layer of the fabric, glass beads applied on the coating in the manner described, and the composition is then dried and cured to form a tough adhesive. The bond should be cured for two hours or more at 100° C.

Example 5

Another composition which forms a firm and resilient bond to glass beads as well as to the cushioning layer may be prepared from a modified Buna S-type polymer and an oil-soluble reactive phenolic resin.

In this example, a rubbery copolymer of 50 parts butadiene, 40 parts styrene and 10 parts acrylonitrile may be used with an equal weight of a compatible oil-soluble heat-advancing phenol-aldehyde resin, dissolved in butyl acetate. The resin may be an alkali-catalyzed reaction product of orthophenyl phenol and formaldehyde, and correspond to the "Bakelite 3360" resin of Example 4. After coating the bond is cured by heating for at least two hours at 100° C.

In the above examples, various types of resins, compatible with the particular polymers employed have been used as adhesive-inducing agents to provide the required high adhesion to glass. Various other compatible phenolic resins may be employed as adhesion-inducing agents and as curing agents to provide the required degree of adhesion value and resilient properties. For example, an alkyd resin formed by reacting glycerol with a rosin-maleic anhydride adduct has provided an effective degree of adhesion when combined with Hycar OR–15 polymer and a plasticizer and properly cured, as by prolonged heating in the presence of a small amount of an urea-formaldehyde resin.

To illustrate exemplary embodiments of the invention, and not to limit it, reference is made to the accompanying drawing in which:

Figure 1 is an enlarged section through bead coated material made according to a preferred embodiment of the present invention;

Fig. 2 is a diagrammatic section of printing apparatus

employing two printing couples in which both sides of a paper web are printed and in which the impression cylinders are shown covered with material embodying the invention;

Fig. 3 is a fragmentary enlarged sectional view showing the action of the printing type on the paper web and the small globular bodies in contact with a portion of the paper web;

Fig. 4 is an enlarged sectional view of a form of invention having particular utility as a blanket for the impression cylinders of newspaper presses wherein the backing comprises laminations of fabric and rubbery elastomers; and

Fig. 5 is an enlarged sectional view of material made in accordance with the invention and having a modified form of backing.

Referring in detail to the drawing (in the several figures of which like reference characters denote similar parts), in Fig. 1 a sheet **8** is shown in which small globular bodies **9** are secured to a cushioning layer **10** by means of an adhesive **11**. Thus the cushioning layer **10** is interposed between the beads or bodies **9** and a flexible backing **12**. The bodies **9** are approximately uniformly spaced and substantially spherical in shape. These bodies are shown submerged in the adhesive to a depth somewhat in excess of one-half their diameters so that each is positively confined in a strong socket wherein surface adhesion alone is not depended upon to anchor the bodies. The film **21** of sizing is shown covering the protruding surfaces of the bodies **9** and the intervening exposed surfaces of the adhesive **11**. As hereinbefore indicated, the sizing film **21** increases the bond and may be of such character to repel or minimize adherence of ink or of other substances that are to be encountered in use. Also as previously indicated, the sizing film **21** may be omitted.

In Fig. 2 the reference character **13** indicates a paper web, which is fed in the direction of the arrow from a supply roll (not shown) between the type cylinder **14**, inked by means of an ink roller **15**, and the first impression cylinder **16** which is preferably faced with our bead coated material **8**. The paper **13**, thus printed on the lower surface, is then fed between a second plate cylinder **17**, similarly inked by an ink roller **18**, and a second impression cylinder **19**, faced with the improved draw sheet or blanket **8**. It will be understood by those skilled in the printing art that in conventional newspaper presses, underpacking (not shown) is disposed between the periphery of the impression cylinder and the draw sheet or blanket. The underpacking may comprise one or two layers of rubber or cork. The addition of wiper rolls (not shown) to wipe the draw sheet or blanket or to moisten it with a suitable ink solvent may be used.

Fig. 3 illustrates in more detail a part of the printing process with which this invention is particularly concerned. The paper web **13** after it has been printed on the lower surface, is fed between a plate cylinder **17**, having type **20**, and an impression cylinder **19**, faced with the improved draw sheet **8**. The draw sheet comprises a flexible backing **12**, and a cushioning layer **10**, and small solid globular bodies **9**, such as glass beads secured to the backing **12** by means of an adhesive **11**. The draw sheet **8** is drawn tightly over underpacking **22** secured to the surface of the impression cylinder **19**.

In practice, glass spheres having a diameter in the neighborhood of .001 to .005 inch, e. g., .003 inch, corresponding to No. 15 bead size and 220 grit size are suitable as a facing for printing press draw sheets and blankets, but smaller or larger sizes may be employed as desired. If small solid globular bodies other than glass spheres are used, the diameter of the individual globular bodies may be as above indicated for glass spheres. The flexible backing is preferably made of cloth, and may be sized or unsized, and of a thickness of the order of .008 to .020 inch, e. g. .015 inch.

Fig. 4 shows a modified sheet in which the globular bodies **9** form the contact facing on a composite backing which may comprise a cushioning layer **10**, a cloth layer **23**, a cushioning layer of a rubbery elastomer **24**, a second cloth layer **25**, another layer of a resilient elastomer **26**, and an inner cloth layer **27**. This backing is particularly suitable for use as a blanket on the impression cylinders of newspaper presses, employing a single layer of underpacking. As previously mentioned, paper may be employed in place of one or more of the cloth layers **23**, **25** and **27** and the number of layers may be reduced.

The blanket is usually 0.080 to 0.092 inch thick and since the beaded surface comprises approximately 0.003 inch, the laminated backing including several fabric layers interposed with layers of resilient material bonded thereto calipers from 0.077 to 0.089 inch. It is apparent that by varying the thickness of the fabric and resilient layers the number of the layers may be increased or reduced to obtain a blanket of the thickness desired.

A further modified form of backing for the beaded sheet is shown in Fig. 5. In this embodiment, a cloth layer **28**, preferably of open mesh, is interposed between two layers **29**, **30**, of resilient materials such as a rubbery elastomer of the types mentioned. The fabric serves as a reinforcement for the cushioning layers **29**, **30** which preferably penetrate the meshes of the fabric to form a well-bonded, integral backing. Beads **9** are bonded to the upper cushioning layer **29** by an adhesive **11** in the manner described. A rubbery material having low stretch may be used as the cushioning layer and the cloth reinforcement may then be omitted.

The flexible backings described provide strength combined with resiliency and a degree of compressibility. Other combinations of composite backing materials as well as variations in the intermediate rubbery layers which are firmly adhered to the fabric layers, as well as variations in the bead sizes and bonding compositions, within the scope of our invention, will be understood from the foregoing description.

Thus the sheet having a discontinuous beaded surface supported on a resilient underlay may be manufactured in the form of a sleeve with a relatively inflexible backing. In use the bead-surfaced sleeve is slipped over the periphery of the impression cylinder and held tightly thereon by clamps or a takeup reel.

Likewise it is to be understood that the improved beaded, laminated material may be semi-permanently bonded on the periphery of the impression cylinder. In this modification one or more layers of cork or rubber underpacking may be firmly cemented to the metal periphery of the cylinder and the beaded sheet bonded thereover.

As previously set forth, the hard, discontinuous surface, of the top sheet, contacting the freshly printed surface of the paper web, may comprise hard rubber or a hard resin, in the form of beads or otherwise, in place of the preferred glass beads. For example, in one embodiment the rubbery layer may be applied over a cushioning layer of the type described, embossed to provide a discontinuous surface, such as minute convex or pyramidal protuberances, and vulcanized to a Shore durometer hardness of 85 to 100. A suitable rubbery compound adapted to be vulcanized to present a discontinuous surface of the desired degree of hardness, is presented in the following example.

Example 6

100 parts butadiene-acrylonitrile copolymer
35 parts sulfur—ground or precipitated
50 parts iron oxide
15 parts plasticizer
10 parts coumarone-indene resin, M. P. 25° C.
2 parts zinc dibutyl dithiocarbamate

This composition is preferably coated upon a resilient or cushioning layer of the types of Examples 1, 2 and 3 in the form of a solution of the above compound in a suitable

solvent such as methyl isobutyl ketone and 2-nitropropane and comprising 30 percent solids. The surface layer may be coated .007 inch thick before evaporation of the solvent and final cure. A hard discontinuous surface of minute protuberances may then be formed by placing the lamination including the cushioning layer and surface layer in a press adapted to emboss a discontinuous surface, such as a convex surface or a pyramidal surface in the rubbery layer. The surface layer and the underlying, partially cured, cushioning layer are then cured to the desired degree of hardness, for example for 90 minutes at 320° F.

In the above example dioctyl phthalate is a preferred plasticizer. Other rubbery polymers may be employed, in place of butadiene-acrylonitrile polymer, such as Buna S polymer, natural rubber and polychloroprene. Other fillers may be employed in place of iron oxide, such as carbon blacks, whiting and preferably ebony rubber dust. Likewise compatible resins other than the coumarone-indene resin mentioned may be employed, as well as other suitable secondary vulcanizers.

It will be readily apparent from the foregoing description that a greatly improved draw sheet or printing press blanket has been produced. Superior results are obtained by the use of small solid globular, spheroidal or pyramidal bodies. They provide a uniform surface supported by strong bonding materials, preferably submerging more than half the surface of each body. Thus a surface is presented which does not break down under heavy usage and in which the points of contact with the web to be printed upon are retained at a uniform elevation. A further advantage, particularly important in printing presses which do not employ make-ready, is derived from the resilient cushioning layer interposed between the beads and the backing. From the foregoing description it will be evident that by the use of this invention the long standing problem of first impression offset may be materially reduced or eliminated.

Moreover, our improved material, by reason of its controlled surface characteristics, resilient support and durability, is adapted to meet the need for improved contact material in a great variety of other fields of use. For example, as a printing accessory, it may be employed in a form of an endless belt in rotogravure presses employed in printing textile material in place of the conventional grey cloth roll or belt. In such textile presses the ink or dye, applied to the textile fabric by an etched, rotogravure cylinder, penetrates the fabric. Our beaded material in the form of an endless belt is trained around the supporting or impression cylinder between the cylinder and the fabric being printed. It picks up the ink or dye penetrating the fabric. The belt then passes through a bath which removes the ink or dye, as part of a continuous process. Likewise, the improved beaded material in the form of an endless belt may be used as a die wiper material for steel engravings. The ink may be washed from the beaded surface and the material reused many times in place of the conventional paper wipes which are thrown away after each use. Our material also has considerable utility in the form of an endless belt for use on bronzing machines, which print a clear varnish and is then dusted with bronze or other powder. Other uses will be readily apparent.

What we claim is:

A draw sheet or printing blanket adapted for use in preventing offset in printing comprising a flexible fabric backing, a continuous cushioning layer of rubbery material of a Shore hardness of 50–75 firmly bonded to one surface of said backing, said cushioning layer being tightly cured to provide a tough and resilient layer, and a surface coating of small spheroidal bodies bonded to said cushioning layer by an adhesive resistant to softening under printing pressure, said cushioning layer having a thickness of at least two-thirds the diameter of said spheroidal bodies.

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