# United States Patent

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[54] SHEET MATERIAL FOR MANUFACTURE OF TRANSPARENCIES
9 Claims, 1 Drawing Fig.


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[56] References Cited

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,425,068 | 8/1947 | McIntosh | 95/1 |
| 2,518,695 | 8/1950 | Jelley | 95/1 |



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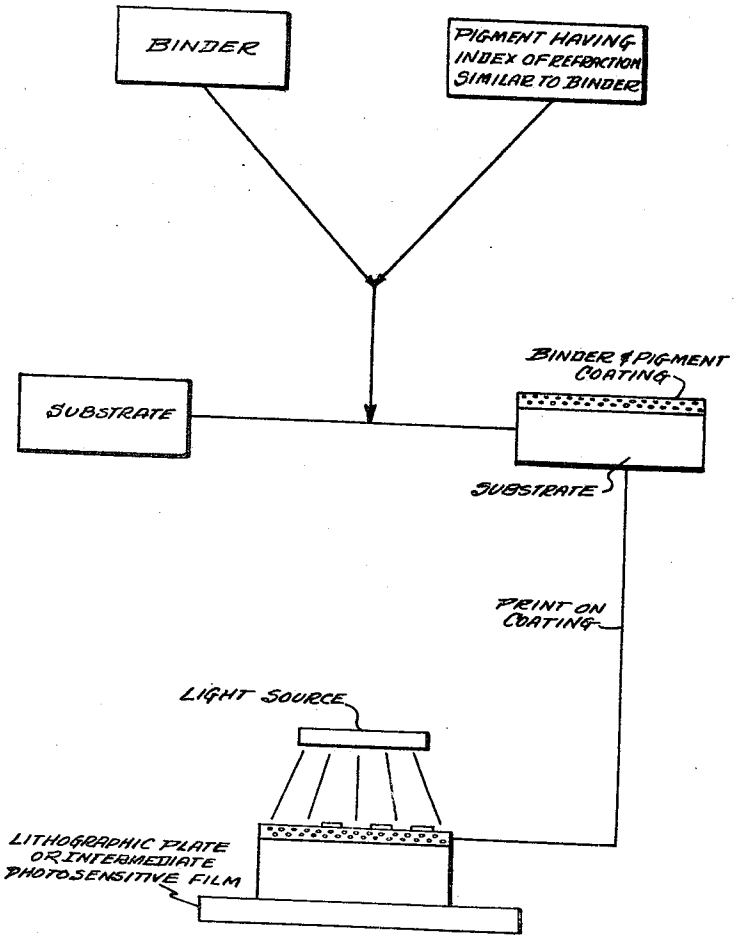
**ABSTRACT:** A sheet material having a transparent backing coated with a layer containing a polymeric binder and particles of solid material which is insoluble in the binder. The refractive index of the solid material varies from that of the binder by at most ± 0.6. The surface of the layer is ink receptive and, by printing on that surface, a transparency is obtained.

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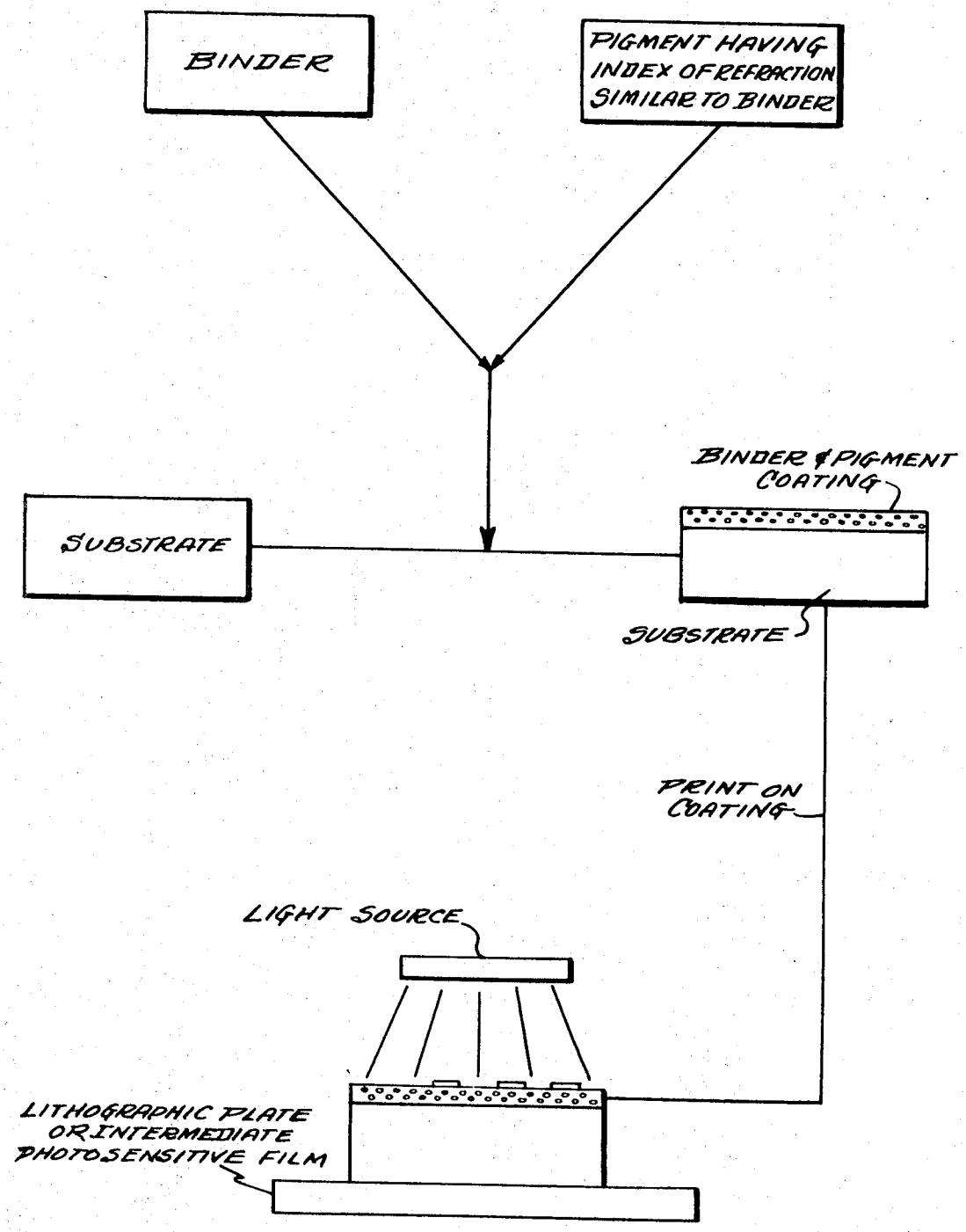


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## SHEET MATERIAL FOR MANUFACTURE OF TRANSPARENCIES

The present invention relates to printing, and more particularly to a sheet material to be used in a process of making offset printing plates from type and halftone engravings. Briefly stated, type and halftones are inked and printed on the sheet material which then functions as a transparency in a photographic process, leading to exposure and development of a photosensitive offset plate. Several methods for producing a transparency useful in this way are known, and the present invention provides improvements.

One form of material suitable for producing transparencies is a pressure-sensitive foil. This is an opaque sheet material which can be made clear by application of pressure. An example of such a material previously made available is offered by duPont under the name Cronapress. In this system, the type is first coated with an antistatic agent, a carefully dusted film is laid over the type, a vacuum is applied and then a pellet pressure device is placed over the film. The device contains over 500 tiny metal balls each weighing about 0.01 oz. and these are vibrated. They strike the type, applying a momentary pressure of about 3 tons per square inch. The method is extremely sensitive to dust between the type and the film, which causes the formation of dark spots surrounded by light halos. A further step is required to correct these. In addition, certain kinds of type cannot be used because of the risk of damage from the impact of the steel balls.

Another form of pressure-sensitive foil is disclosed in copending U.S. Pat. application of Fleming et al. No. 434,694, filed Feb. 23, 1965. It involves a coating of plastic, containing an opacifying agent, on a flexible base, which is rendered opaque and pressure sensitive by contact with an aqueous fluid, e.g., by immersion in boiling water, prior to use. This process, while an improvement over prior art, still has limitations, especially in halftone work.

Another material useful for this purpose is a form of heat sensitive foil described in U.S. Pat. No. 2,993,805, which utilizes essentially a sheet of vesicular photographic material which has been exposed overall to light. The exposed sheet is contacted with metal type at a sufficiently elevated temperature to effect development of the film in the areas of contact. While a transparency is obtained, the method has the practical disadvantage that the developed areas tend to spread beyond the area contacted by the hot type because of diffusion of heat. This gives a fuzzy appearance to the characters, and makes halftone work very difficult.

In another process, repro-proof printing paper, a paper coated with a pigment in a binder, is passed over the type and/or halftone which has been inked, and it picks up the ink on contact with the characters. The repro-proof is then reflection-photographed with a special camera, ordinarily with silver-sensitized film, to obtain a silver negative which can be contact printed onto a negative-working offset printing plate. The inherent difficulty in this process is that the finite resolution of the camera results in the loss of many small details of the original metal type or halftone in making the silver negative.

A variant on the above process is repro-proof printing film, in which the coating which contains pigment is applied to a transparent base and is of low enough density to allow contact printing it to silver-sensitized film to obtain the silver negative print. Since no camera is used, resolution is no longer a serious problem, and there is less trouble in retaining fine details of the original metal form. The known material comprises a binder and titanium dioxide as a pigment. However, such a material is incapable of printing directly to an offset plate and requires lengthy exposure in printing to the silver-sensitized film.

In essence, the present invention relates to an improved product of the character of repro-proofing film. The product has sufficient transmittance to light on the near ultraviolet, the range of maximum sensitivity of diazo-sensitized offset printing plates, to allow exposure through the product directly onto such plates, eliminating the need for intermediate formation of a negative on silver film and the associated steps and extra equipment to process silver-sensitized film.



The material of the present invention comprises coating on a clear substrate, of a homogeneous mixture of binder and small particles of a solid material which is insoluble in the binder The particles of solid material and the binder have closely similar indices of refraction.

The small particles of solid material may be of almost any material which is relatively transparent and insoluble in the binder, in the sense that it forms a separate solid phase having a distinct boundary between itself and the binder. Most of the materials found useful have been inorganic, but suitable organic substances may also be used. By relatively transparent, it is intended to signify that the transmittance is at least 30 percent for a sample 0.00092 millimeters thick. It is not necessary that the material be transparent to all wavelengths of light, but only the portion of the spectrum required to expose a photographic product, e.g. an offset printing plate. For practical purposes with diazo and silver-sensitized photographic products, the solid material should have a transmittance of at least 30 percent for at least a portion of the spectrum in the range 3,400—6,000 angstrom units.

The size of the particles of solid material should be relatively small. Best results have been observed where the particle diameter is in the range 0.1 to 3 microns. Of course the particles should be relatively inert chemically to the binder. The following is a list of some of the many materials which meet the above requirements.

| | Percent transmission at 4047 A. | Index of refraction ($\lambda$=589.3 m$\mu$ 20° C.) |
|---|---|---|
| Zinc oxide | 40 | 2.01 |
| Lead carbonate (basic) | 66 | 2.02 |
| Lead sulphate (basic) | 63 | 1.98 |
| Antimony oxide | 47 | 2.00 |
| Talc ($3MgO \cdot 4SiO_2 \cdot H_2O$) | 90 | 1.59 |
| Precipitated chalk | 86 | 1.66 |
| Silica | 88 | 1.48 |
| Terra alba ($CaSO_4 \cdot 2H_2O$) | 76 | 1.52 |

It also has been found possible to use small glass spheres.

The binder is a continuous coating of natural or synthetic normally solid organic polymer. It too must be relatively transparent, that is it must have a transmittance of at least 30 percent to light, as defined above, to at least a portion of the spectrum, preferably in the range 3,400—6,000 angstrom units. Preferably, the binder wets the dispersed small particles of solid material but this is not essential for the broader purposes of the invention. Reasonable resistance to printing inks is desirable.

Polymers which are suitable are the vesicular photographic vehicles disclosed in James, U.S. Pat. No. 3,032,414; Parker et al., U.S. Pat. Nos. 3,161,511 and 3,251,690; Daech, U.S. Pat. No. 3,189,455 and Notley et al., application Ser. No. 403,633 filed Oct. 13, 1964, Ser. No. 405,597 filed Oct. 21, 1964 and Ser. No. 533,745 filed Feb. 1, 1966.

In addition to the individual requirements of the binder and particles of solid material set forth above, an important requirement is that the refractive index of each material be essentially the same as that of the other material. That is, the refractive indices of the small particles of solid material and the binder should differ by at most ±0.6.* Preferably, the refractive index of each material is in the range 1.4—2.0. As a practical matter this requirement precludes using a number of materials which might otherwise be satisfactory. For example, titanium dioxide has a refractive index of 2.52 for the anatase type and 2.75 for the rutile type which is not close to ordinary polymers which might be used as binders.

*The term refractive index as used herein refers to the refractive index at 20° C. for Sodium D-line, $\lambda$ = 589.3 $\mu$, commonly designated $N_D$ 20°.

The relative amounts of binder and particles of solid material can be varied. In general, the amount of particles of solid material affects the adhesion of ink to the surface of the product. Therefore, for any given pair of materials, it is desirable to measure ink adhesion as a function of proportions. Ink adhesion can be measured, after drying, by rubbing. A more critical test, probably more severe than required, is the Scotch Tape test in which one tries to lift the ink with pressure-sensitive tape. This is a simple experimental procedure which enables determination of optimum proportions. However, in general, one will use about 20—80 percent by volume each of binder and particles of solid material, preferably about 50 percent by volume of each.

The binder and particles of solid material are blended by any suitable means to form a uniform mixture and coated on a backing to form a layer in which the particles are uniformly dispersed in the polymer. For example the particles of solid material may be blended with a solution or dispersion of binder and the mixture coated on a backing. The solvent or dispersing liquid may be evaporated. Ordinarily the coating has a dry thickness of about 0.02 to 5 mils, or corresponding to about 5 to 36 pounds per ream, a ream being 3,000 square feet.

As a backing material, any material which is essentially transparent to light of the wavelength used with the product is suitable. For example, clear polyethylene, polypropylene, polycarbonates (e.g. G.E.'s Lexan), cellulose acetate or Mylar (oriented polyethylene terephthalate) are satisfactory. Glass plates also may be used.

The process is illustrated schematically in the drawing and by the following examples, wherein all parts and percentages are by weight unless otherwise indicated.

EXAMPLE 1

| | Parts by weight |
|---|---|
| Zinc oxide | 137. 5 |
| 40% solution of polyvinyl acetate in ethanol | 75. 0 |
| Toluene | 195. 0 |

In order to obtain optimum dispersion, the zinc oxide was added to the resin concentrate and mixed at a very high speed to impart work on the system before adding the additional solvent (toluene). After adding the solvent, the mixture is coated on a clear Mylar polyester base, using traditional thin film coating equipment, at a thickness which corresponds to approximately 18 pounds/ream of coating after drying. The coating is dried at 140° F. for 5 minutes.

A sample so prepared was mounted on a standard letterpress and passed over an inked type form. The ink was well received by the sheet, it showed no tendency to spread, and the letters were sharp and clear.

EXAMPLE 2

A sample prepared as in Example 1 was printed as in Example 1. It was contact printed to a piece of vesicular photographic image film by exposure in a vacuum frame to a 400-watt mercury arc lamp for 2 minutes and developed with a 240° F. hot roll providing a dwell time of 2 seconds. The vesicular film was then contacted to a negative offset plate in the usual manner familiar to those skilled in the art. A plate of good uniform density was produced.

EXAMPLE 3

The following were assembled:

| | Parts by weight |
|---|---|
| Silica | 75. 0 |
| 40% solution of polymethyl methacrylate in toluene | 110. 0 |
| Toluene | 120. 0 |



These were mixed, coated and dried as in Example 1. A sample thus produced was printed as in Example 1 and then contact printed to an autopositive silver film using a 15 second exposure with a standard carbon arc source. The autopositive print was then contact printed to a positive working offset plate, resulting in a good quality image.

EXAMPLE 4

The following were assembled:

| | Parts by weight |
|---|---|
| Talc ($3MgO \cdot 4SiO_2 \cdot H_2O$) | 137. 5 |
| 40% solution of Saran F120 in methyl ethyl ketone | 75. 0 |
| Methyl ethyl ketone | 195. 0 |

These were mixed, coated and dried as in Example 1. A sample thus produced was mounted on a standard proofing press and passed over an inked halftone plate. Again, there was no spreading of the dots on the proof. It was then contact printed to a silver halide film with a 12 second exposure from a Colight pinpoint source. The silver print was contact printed to a negative-working plate, and the resulting image showed sharp definition with good dot quality and no spreading.

EXAMPLE 5

The following were assembled:

| | Parts by weight |
|---|---|
| Terra Alba ($CaSO_4 \cdot 2H_2O$) | 100. 0 |
| 40% solution of cellulose acetate butyrate in methyl ethyl ketone | 100. 0 |
| Methyl ethyl ketone | 150. 0 |

These were mixed, coated and dried as in Example 1. A sample thus produced was mounted on a standard letterpress and passed over halftone metal form which previously had been inked. The sample was used as in Example 2. The halftone dots maintained proper size and clarity and a good plate was produced.

EXAMPLE 6

A sample was produced and printed as in Example 1. It was then contact printed directly to a positive working offset plate, using a carbon arc source for 3 minutes. The resulting plate was clear of all background and had clear definition of the image.

I claim:

1. A sheet material for manufacture of a transparency said sheet material comprising a layer coated on a transparent backing said layer having an ink-receptive exposed surface for receiving printing which layer comprises a homogeneous mixture of:
   1. a polymeric binder which has a light transmittance of at least about 30 percent for a sample 0.00092 mm. thick in at least a portion of the spectrum, and;
   2. particles of a solid material which is insoluble in said binder and has a light transmittance of at least about 30 percent for a sample 0.00092 mm. thick at a wavelength at which said binder has said transmittance, the refractive index of said solid material varying from the refractive index of said binder by at most ±0.6.

2. A sheet material as set forth in claim 1 in which said binder and said particles each has an index of refraction in the range 1.4 to 2.0.

3. A sheet material as set forth in claim 1 in which the amounts of said binder and said particles are each 20 to 80 percent by volume of said sheet material.

4. A sheet material as set forth in claim **1** in which said particles have a diameter of about 0.1 to 3 microns.

5. A sheet material as set forth in claim **1** in which said homogeneous mixture is a coating on a transparent backing.

6. A sheet material as set forth in claim **5** in which the thickness of said coating is 0.02 to 5 mils.

7. A sheet material as set forth in claim **1** in which said particles and said binder have a light transmittance of at least 30 percent in at least a portion of the spectrum between 3,400 and 6,000 angstrom units.

8. A sheet material receptive to printing for manufacture of a transparency comprising a coating 0.02 to 5 mils thick on a transparent backing of a homogeneous mixture of:

1. about 20 to 80 percent by volume of said mixture of a polymeric binder which has a light transmittance of at least about 30 percent for a sample 0.00092 mm. thick in at least a portion of the spectrum between 3,400 and 6,000 angstrom units, and an index of refraction in the range 1.4 to 2.0 and



2. about 80 to 20 percent by volume of said mixture of particles having a diameter of about 0.1 to 3 microns of a solid material which is insoluble in said binder, has an index of refraction in the range 1.4 to 2.0 and has a light transmittance of at least about 30 percent for a sample 0.00092 mm. thick at a wavelength between 3,400 and 6,000 angstrom units at which said binder has said light transmittance.

9. A sheet material as set forth in claim **8** in which said particles are zinc oxide.