ultraviolet light-curable materials and adjuvants. For example, an ultraviolet light-curable paint can be prepared by diluting a polymer or prepolymer of the acrylic, polyester, polyurethane, polyamide or epoxy series having at least two unsaturated bonds, preferably acrylic or methacrylic double bonds, polymerizable under the action of ultraviolet light per molecule with a monomer polymerizable under the action of ultraviolet light, preferably a polyol polyacrylate resulting from the reaction of one molecule of a polyhydric alcohol with at least two molecules of acrylic or methacrylic acid, and adding a known sensitizer or as required, a coloring pigment, an extender pigment, and various adjuvants to adjust the viscosity of the dilution to a right one.

Usually, a resist film required to have a thickness of 8 to 15 μm is formed by coating this paint at a line speed of 20 to 50 m/min.

SECOND STEP

The substrate **1** coated in the first step is then introduced into a primary ultraviolet irradiating device **4** to irradiate ultraviolet light to the coating of the paint **3**. Thus, as shown in FIG. **2**, a pre-cured coating **3'** is formed on the substrate **1**. In this step, the degree of curing of the pre-cured coating **3'** is important. It is necessary to adjust curing to such an extent as to permit the printing in the third step and the dissolving and peeling of the printed layer and the coating beneath it in the fourth step. It is easy to adjust the pre-curing to the required degree of curing if the irradiating conditions are pre-scribed by considering the intensity of ultraviolet irradiation, the thickness of the coating, the curability of the paint, the line speed, etc.

THIRD STEP

By using a printing device **5**, a light-insensitive nontransparent ink having the ability to shield ultraviolet light is applied in a predetermined pattern P to the coating **3'** pre-cured in the second step, as shown in FIG. **3**. Thus, a printed layer **5'** is formed on the pre-cured coating. The printing is done preferably by a rotary relief or lithographic offset printing method. The printing ink desirably used in this invention is generally a sheet relief ink or a sheet lithographic ink containing 15 to 20% by weight of carbon black.

Intaglio and gravure printing methods may also be available. But because the cost of making plates having different patterns for the individual lots is high, such printing methods are economically disadvantageous.

In the method of this invention, therefore, relief printing and lithographic printing are suitable. Commercially available plates such as photosensitive resin relief plates, photosensitive flexographic plates, lithographic PS plates, paper masters and waterless lithographic plates can be utilized in this invention.

When the substrate is in the form of a sheet or block, a negative or positive original is made according to a predetermined pattern and brought into contact with the aforesaid plate material, followed by exposure and development to make a printing plate. The printing plate is mounted on a printing press in accordance with the procedure of general lithographic or relief printing, and printing is performed on the pre-cured coating of the substrate.

When the substrate is in the form of a long roll or coil, it is generally desirable to print the pattern continuously. In this case, the relation expressed by the following formula should be exactly maintained between the pitch of the pattern and the diameter of the printing plate.

$$R = n \times (a/\pi)$$

wherein

R is the cylinder diameter of the required plate or rubber blanket cylinder,

a is the pitch of the pattern, and

n is the number of patterns obtained during one rotation of the plate.

In this case, a relief or lithographic plate is prepared by superimposing a negative or positive original having the pattern arrangement and size conforming to the diameter of the plate cylinder on an unexposed plate so that the image can be continuously printed with a predetermined pattern and pitch, exposing the plate to light and developing the exposed image thereby to form a positive image of the pattern.

The present inventors have ascertained that the desired pattern can be printed continuously by direct relief printing at a printing speed of 20 to 50 m/min. by exposing and developing a commercially available liquid or solid photosensitive resin plate on a plane, wrapping this plate accurately about the cylinder of a printing press by means of a dual surface-adhesive tape and connecting both ends of the plate carefully so that the gap between them is less than 0.5 mm.

Since the predetermined pattern should be continuously printed at a specified pattern pitch, the plate cylinder diameter R should be variable according to the pattern pitch so that R satisfies the equation $R = n \times (a/\pi)$.

FOURTH STEP

The substrate **1** having the printed layer **5'** formed thereon in the third step is then introduced into a secondary ultraviolet irradiating device **6**, and ultraviolet light is irradiated on the entire surface of the substrate **1**. As a result of this ultraviolet irradiation, that portion **3''** of the pre-cured coating which does not have the printed layer **5'** thereon is completely cured as shown in FIG. **4**, whereas that portion **3'** of the pre-cured coating which has the printed layer **5'** formed thereon is shielded from ultraviolet by the printed layer **5'** and does not undergo photocuring reaction, with the result that the part **3'** is still in the pre-cured state as in the second step.

FIFTH STEP

The substrate **1** which has undergone ultraviolet irradiation in the fourth step is then introduced into a developing device **7** having a jet nozzle **8**. By jetting a developer solution **9** from the jet nozzle **8**, the printed layer **5'** and the pre-cured coating **3'** beneath it are dissolved or peeled. Thus, there is left on the substrate the completely cured coating **3''** having a pattern P' which is in a complementary relation to the predetermined pattern P (i.e., the pattern of the printed layer **5'**) formed by the printing ink, as shown in FIG. **5**.

In the illustrated embodiment, the developing device used is of a jetting type, but the invention is not limited thereto. Various other types of developing devices, such as the one having a developing tank for dipping, can be used. The developer solution **9** is a suitable organic solvent which can dissolve or peel the printed portion of the substrate **1** and does not attack the com-