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ELECTRICALLY INSCRIBABLE LITHOGRAPHIC OFFSET PRINTING PLATE

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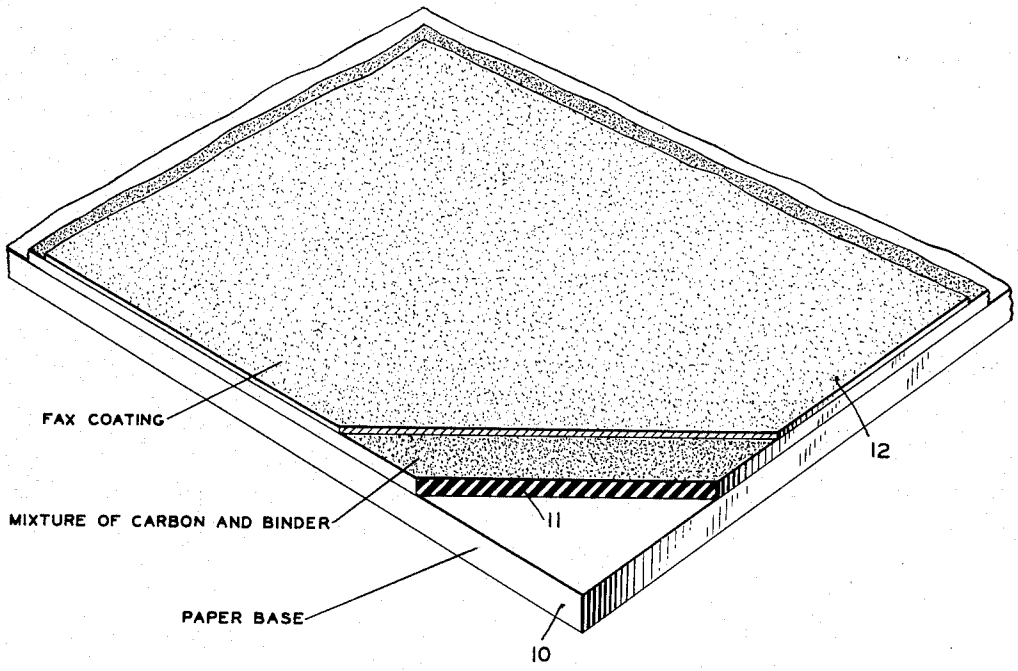

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ELECTRICALLY INSCRIBABLE LITHOGRAPHIC OFFSET PRINTING PLATE

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1 Claim. (Cl. 101—149.2)

This invention relates to an electrically inscribable lithographic offset printing plate from which a number of copies of any subject matter written or recorded thereon may be made by lithographic offset printing methods, and in which the subject matter may be recorded by means of telegraph facsimile or other types of electrical signals which are applied to selected elemental areas of the printing plate by means of an electrical stylus that scans the recording surface of the plate.

Facsimile communication methods are now commonly employed for the transmission and reproduction in facsimile of telegrams, press dispatches, pictures, maps, drawings and other subject matter. Such methods utilize a transmitting blank which is scanned either by optical or electrical pickup means, depending upon the character of the transmitting blank, for generating the facsimile signals. Reception of the messages commonly is effected on dry electrosensitive recording blanks in which the marking effects are obtained or are accompanied by removal of a high-resistance or insulating surface coating in elemental areas thereof in response to marking currents applied thereto by the receiving stylus. Such a blank commonly has comprised a base sheet of paper impregnated with a conductive substance such as carbon black, thereby to provide a relatively low-resistance path through the base sheet for the marking currents after they have passed through the high-resistance or insulating surface coating of a pigment that masks the underlying black-colored conductive sheet.

The instant plate may comprise a base sheet of paper, which may be composed of ordinary writing or manila paper, having on one side thereof an oleophilic, water-repellant coating of conductive carbon black in a binder of the character hereinafter disclosed thereby to provide a conductive layer, or the base sheet may comprise a carbon impregnated paper which provides good conductivity through the sheet and coated in a manner similar to that in the foregoing non-conductive base sheet. In either case where added durability is desired a resin impregnation may be employed of the type commonly used in high wet-strength paper. In each of the foregoing types the coated base sheet has applied thereto a high-resistance masking coating. Recording may be effected by condenser action since the conductive layer and the metallic drum or platen of the facsimile recorder form condenser plates separated by the dielectric paper base sheet, although preferably, as disclosed in Kline Patent No. 2,528,005, an electrode is in contact with a marginal edge or other portion of the conductive coating of the blank, whereby the marking currents flow by conduction through conductive coating of the blank instead of by condenser action, or the marking currents may flow through the blank to the underlying platen when a conducting base sheet is employed.

In blanks adapted for recording subject matter by facsimile or other electrical signals, the overlying masking coating is decomposed, volatilized or blasted off in response to the marking currents, and for lithographic offset purposes it is desirable or necessary that the exposed layer of carbon be highly ink-receptive. Heretofore it has been proposed to employ the conductive carbon dispersed in a lacquer to provide good ink receptivity, but it was found that the percentage of lacquer solids relative to that of the conductive carbon had to be kept very low, for example, of the order of 1 to 3 parts of resin to 10 parts of carbon, and this resulted in poor ink-receptive characteristics, and when it was attempted to improve the ink-receptivity by the addition of more lacquer solids relative to the carbon it was found that the resistance of the carbon coating was unduly increased so that it did not provide a sufficiently good conducting path for the marking currents. It was found that a water solution of a water-soluble binder would in some cases provide better conductivity of the carbon layer, but the ink-receptive characteristics were inadequate.

One of the objects of the instant invention is to provide an electrically inscribable offset printing plate in which high ink receptivity of the recorded subject matter is obtained and at the same time cause the carbon layer to have good conducting characteristics, whereby excellent definition may be obtained during a recording operation and from which a large number of clean and sharp copies may be made by lithographic offset printing methods.

Another object of the invention is to produce a lithographic plate having the foregoing advantages and which may be made and sold at but a fraction of the cost of other lithographic plates in commercial use in which there is provided an ink repellant surface on which may be imprinted ink-receptive characters.

A further object of the invention is to produce an inexpensive printing plate of the character described on which pictorial subject matter may be recorded with suitable gradations in tone, and from which a large number of copies may readily be obtained by offset printing methods.

Other objects and advantages will appear from the following detailed description of a preferred embodiment of the invention, taken in connection with the accompanying drawing in which:

FIG. 1 is a perspective view of a lithographic offset printing plate constructed in accordance with the instant invention.

Referring to the drawing, the printing plate preferably embodies a non-conductive base sheet **10** of paper. One side of the sheet has an adherent conductive coating **11** of finely divided conductive carbon uniformly and homogeneously dispersed in a suitable resinous or elastomeric binder of the character hereinafter disclosed. On the coating **11** is applied an adherent electrosensitive facsimile surface coating **12** which masks the underlying black colored conductive layer **11**. The facsimile surface coating, which bears the legend "Fax Coating" in the drawing, may comprise any of a number of pigments suspended in a binder of the character hereinafter set forth and adapted for marking purposes, for example, cuprous thiocyanate, lead thiocyanate, zinc sulphide, lead thiosulphate, the oxides of lead, titanium and zinc, and others, referred to in U.S. Patents Nos. 2,251,742, 2,294,146, 2,294,149, 2,528,005 and 2,555,321.

It will be appreciated that the thickness of the paper **10** and that of each of the coatings **11** and **12** is greatly exaggerated in the figure in order to more clearly disclose the different layers; in practice, the paper base **10** will ordinarily have a thickness of from 2½ to 3 mils, the mixture of carbon and binder **11** usually will have a thickness of from 0.8 to 1.2 mils, and the facsimile coating generally will have a thickness of 0.1 mil, plus or minus 25%. Preferably the facsimile coating is kept as thin as possible, consistent with reasonable masking and contrast characteristics, in order that when this coating is removed in elemental areas by the action of the marking currents, the exposed layer **11** will not lie much below the surface

of the blank. Thus, in the lithographic printing operation the ink roller in the offset press will readily ink all of the exposed areas, and in the production of lithographic copies made therefrom by planographic printing methods there will be maximum ease in transfer of the ink to the impression sheets. Also, with the thinner facsimile coating, less power is required in the stylus circuit to effect removal of the coating in the elemental areas to be marked, and hence there is less chance of disturbing the underlying ink-receptive carbon layer. It will be understood that the nature of the facsimile coating is such that when moistened with the usual repellant solutions the ink does not appear on the hydrophilic and ink-repellant surface. The thickness of each of the foregoing layers or coatings **11** and **12** may be varied within a considerable range. Moreover, as hereinbefore stated, the paper base **10** instead of being non-conductive may be impregnated with conductive carbon or metal powders in order to make the entire sheet conductive. Paper is usually employed as the sheet **10** since it is easy to handle and is inexpensive, but the sheet **10** may be comprised of a plastic, fabric, or other suitable material, in which case the layer **11** is relied upon to make the blank conductive.

The layer **11** differs from the conducting layers heretofore employed in facsimile recording blanks in that it is substantially thicker and substantially impervious to water, and comprises carbon and binder in such relative proportions that the resin substantially equals or exceeds the amount of carbon by weight. We have discovered that if a natural or artificial latex of a resin or elastomer is employed as a binder, in which the carbon is uniformly dispersed, this permits the use of such binder in the amounts stated without substantially increasing the electrical resistance of the resulting carbon layer, as distinguished from other resin-bonded coatings heretofore employed in which the amount of carbon had to be from 3 to 10 times the amount of binder in order to retain the necessary electrical conductivity, and which resulted in inadequate ink-receptivity. The precise reason why the conductivity of the layer is not substantially reduced notwithstanding the relatively large amount of binder, resulting from the evaporation of water from a latex of the binder, is not known, but that this is so has been adequately demonstrated in practice.

The natural and artificial latices which are especially suitable in connection with the instant invention, either alone or in combination, are acrylic ester resin, styrenated butadiene, polystyrene, neoprene, acrylonitrile-butadiene, polyvinyl acetate, polyvinyl chloride, and natural rubber latex. For the purpose of the instant invention the term "latex" is defined as a colloidal aqueous dispersion of non-fluid particles of polymeric resins or elastomers. The acrylic latices are those made from acrylic ester resins and do not include the water-soluble polyacrylates or sodium polyacrylates. Tests indicate that all of the natural or artificial latices of a resin or an elastomer, whether plasticized or not, will exhibit the foregoing unusual characteristics. The term "resin" as employed herein means a solid or semi-solid, complex, amorphous mixture of organic substances, having no definite melting point and showing no tendency to crystallize. A resin is characterized by such physical properties as a typical luster and a conchoidal fracture rather than by any definite chemical composition. The term "elastomer" as employed herein is defined as one of a class of polymerized compounds characterized by elastic, rubber-like properties, as natural and synthetic rubbers and various plastics. The foregoing latices are all readily available commercially, for example, Rohm & Haas acrylic ester resin, Rhoplex WN 80; Dow styrenated butadiene, 512 K; Carbide and Carbon polystyrene, BKS 114; Goodrich neoprene, Hycar 1562; Goodrich acrylonitrile-butadiene, Hycar GR 15; Shawinigan polyvinyl acetate, Gelva TS 41; Goodrich polyvinyl chloride, Geon 576; and General Latex natural rubber, Vultex. Conductive carbons of the types suitable for this

purpose are usually gas black which is commercially available either as a powder or aqueous paste dispersion, for example, Columbian, Statex B or R; or United, Dixie 60. These conductive blacks are distinguished from ink blacks which are usually produced by the combustion of oil and are essentially non-conductive. The conductive carbon blacks which are available commercially in aqueous paste form are eminently suitable for mixing with the latex binder. A suitable formula for the coating composition as applied is as follows, the parts being stated on a weight basis:

	Parts
Conductive carbon	20
Resin or elastomer	32
Water	100

The above formula may be restated in terms of commercially available materials, as follows, the parts being stated on a weight basis:

	Parts
A	
Aqueous carbon dispersion (38% solids)	50
Water	10
B	
Resin or elastomer latex (40% solids)	80
Water	10

The A portion of the above is poured slowly into the B portion, and mixed by propeller stirring.

The coating composition is applied to the paper by any of the known coating methods, such as roller transfer or spraying in conjunction with doctor blade, leveling bar, air knife or reverse roll for controlling the desired amount of coating composition per unit area. A preferred weight of the dried coating is approximately from 1.3 grams to 2.0 grams per square foot, and as hereinbefore stated the thickness will be approximately from 0.8 mil to 1.2 mils. As appears from the foregoing, the carbon should be predispersed in water, and the resulting aqueous carbon dispersion added slowly to the latex. In practice it has been found preferable to add an aqueous carbon dispersion of 30% to 35% solids to a latex of 35% to 40% solids. Adequate mixing is effected by propeller stirring.

It is to be understood that the relative proportions of conductive carbon and the resin or elastomer binder referred to in the foregoing formulas may be varied over a considerable range between limits in which the amount of binder is approximately equal to, or approximately double, that of the carbon, on a dry weight basis, although it will be appreciated that this range may be affected somewhat by the use of a conductive carbon having inherently a higher or lower degree of conductivity than that of Statex B or R, or Dixie 60. With the foregoing range the desired degree of conductivity of the layer may be maintained by adjusting the amount per unit area of the applied coating composition within the limits above stated, i.e., approximately 1.3 grams to 2.0 grams per square foot. The conductivity of the layer **11** is such that the resistance of an area of the layer between two concentric metallic rings, having their closest edges spaced 7/8 inch apart, and applied to the surface of the layer under a total load of 600 grams, is between 100 and 500 ohms, and preferably is between 200 and 225 ohms. It will be understood that any other suitable method may be employed for determining the proper range of resistance values of the layer **11**, and that these values may be otherwise expressed, such as the value in ohms per square which is at present under consideration for adoption as a standard for expressing the resistance of surfaces and thin films, and in the foregoing preferred range would be expressed as approximately 1400–1575 ohms per square. The ranges of resistance values given are such that sufficient resistance is provided to insure the liberation of power necessary to cause removal of the facsimile coating **12** in just those elemental areas

where marking currents are applied by the stylus, and yet have sufficient conductivity, i.e., the electrical resistance is sufficiently low, to provide a good conducting path through the ink-receptive layer **11** for the passage of marking currents of such amplitude as will expose the surface of the layer without any substantial disruption thereof.

The viscosity of the latex-carbon mixture may be increased, if desired, by the addition of small amounts of water-soluble materials, such as carboxymethyl cellulose or other water-swelling colloid or the like, and occasionally such an addition is desirable to improve mechanical stability of the latex.

The facsimile coating or film **12** may comprise any of a wide variety of pigments either alone or in combination. As to the binder, however, and in contradistinction to facsimile coating in which no lithographic printing qualities are required and in which a latex can be used as a binder, in accordance with the instant invention it is essential that the binder be a water-soluble material which upon drying becomes or is made water-insoluble, but remains quite hydrophilic in order that the film will retain an adequate amount of the repellent solutions commonly used to prevent the transfer of ink to the unrecorded areas of the plate. Any of a number of such binder materials well known in the lithographing art may be used, either individually or in combination, for example, polyvinyl alcohol, carboxymethyl cellulose, casein, gum arabic, albumen, and the like, and these are used with appropriate insolubilizing agents, such as dimethylol urea, divalent metal salts, formaldehyde, hexamethylene tetramine, chromates, and others, all in controlled amounts to secure the desired degree of insolubility.

With any of the foregoing pigments and binder materials for the facsimile coating, a wide range of ratios of pigment to binder may be used. Preferably, however, a ratio of the order of three parts of pigment to one part of binder is employed, particularly when the plate is to be used for electrically inscribing the subject matter to be reproduced. For example, a suitable formula is as follows, all parts being by weight:

	Parts
Water-soluble binder	10–20
Pigment	30–70
Water	100–250

A specific preferred formula, all parts being by weight, is as follows:

	Parts
Casein or polyvinyl alcohol	15
Pigment	50
Water	185

A small amount of an insolubilizing agent, for example, from 5% to 25% of the water-soluble binder, is employed, and smaller amounts of well-known dispersing or anti-foaming aids may be used, if desired. A water-soluble binder which has been found eminently suitable for the present purpose is a grade of casin commercially available from the Borden Company and identified as Protovac 416, or a polyvinyl alcohol, Elvanol 70–05, sold by the Dupont Company.

Mixtures of cuprous thiocyanate, zinc sulphide and/or zinc oxide are preferably employed as pigments in the facsimile coating; a mixture of three parts of cuprous thiocyanate and one part of zinc sulphide has been found to be especially suitable. Since an aqueous top coating is employed this presents commercial advantages when cuprous thiocyanate is employed as a pigment. This pigment must be manufactured specially for this use and since it has previously been used in a lacquer-type coating it has been necessary heretofore to ship it to another manufacturer for grinding in lacquer. With an aqueous coating of the type disclosed herein, the steps of filtering or centrifuging and drying, shipping and redispersion in lacquer may be eliminated, and substituted by merely mixing with a water-soluble binder. In general, the relative proportions respectively of the various pigments is not critical, although the thickness of the facsimile coating is fairly critical; if the coating is too thin there is not enough of a hydrophilic layer to repel the transfer ink, and if the coating is too thick it will not be completely removed from the recorded areas and the sharpness of definition and the tone gradations will be impaired. The coating is thinner than that customarily employed in facsimile recording blanks, and usually is of the order of $\frac{1}{10}$ of the thickness of the conductive layer; the weight of the coating usually is 0.3–0.5 gram per square foot of surface, and as previously stated the thickness thereof is 0.1 mil, plus or minus 25%. As in the case of the carbon-latex coating, the facsimile coating may be applied by any of the several well-known coating methods.

While there is shown and described herein one illustrative embodiment of the invention, various improvements and modifications will present themselves to those versed in the art without departing from the invention, and the invention is therefore not limited except as indicated by the scope of the appended claim.

What is claimed is:

An electrically inscribable lithographic offset printing plate, comprising a base sheet having thereon an adherent, highly electrically conductive, oleophilic, ink-receptive, water-repellant layer essentially composed of a water-insoluble evaporation residue of a uniform dispersion of finely divided electrically conductive carbon in a latex composed of a colloidal aqueous dispersion of an oleophilic binder selected from the group consisting of acrylic ester resin, styrenated butadiene, polystyrene, neoprene, acrylonitrile-butadiene, polyvinyl acetate, polyvinyl chloride and natural rubber, said binder being present in an amount which is at least substantially equal to the amount of carbon by weight and having the property of binding the carbon particles to the sheet, said amount of binder being insufficient to substantially reduce the conductivity of the carbon particles so as to permit passage of electrical marking currents of such magnitude as will produce fine definition of recorded subject matter, said conductive layer having thereon a thin adherent surface coating essentially composed of white pigment dispersed in a hydrophilic substantially water-insoluble binder of such character as to be disintegrated in elemental areas thereof when subjected to said electrical marking currents to expose the underlying ink-receptive layer.

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