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CARBON PAPER

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Fig. 1

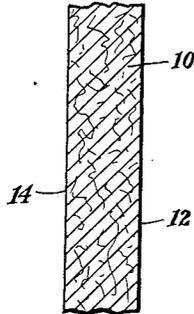


Fig. 2

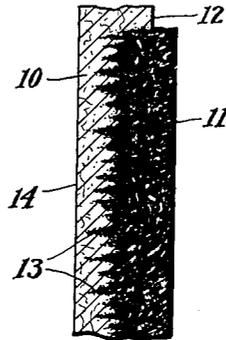
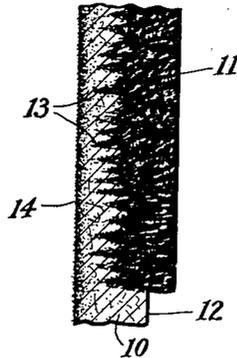


Fig. 3



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## UNITED STATES PATENT OFFICE

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## CARBON PAPER

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7 Claims. (Cl. 91—68)

This invention pertains to the general class of manifold sheets and more particularly to carbon paper.

Carbon paper, as known in the art, comprises a thin sheet of suitable paper, coated on and impregnated partially through one of its surfaces with a more or less plastic but not free flowing composition carrying coloring matter, usually carbon black or other suitable black or blue coloring material. The paper varies as to weight and/or relative absorbency according to the demands of the trade. The color-compositions employed are basically mixtures of waxes, oils and oily substances, and coloring matter. By way of example, carnauba wax, a mineral oil or other oil compatible with the wax, and carbon black, is frequently used.

A great deal of difficulty is experienced in obtaining good adhesion of the color composition to the paper. The color composition has a tendency to crack and break off in the ordinary use of the sheets due, among other things, to crinkling and sharp bending of the sheets not only when contacted by the keys of the typewriter but also during handling. The lighter weight carbon sheets have a distinct tendency to form tree-like impressions on the copies, which is primarily due to unavoidable creasing and wrinkling during insertion of the same with other sheets in the typewriter.

There is also a distinct tendency for carbon papers to curl. This is particularly true of the lighter weights, and all weights will curl at least to some extent during damp weather. Curling of carbon papers causes a great deal of inconvenience in handling and results in a considerable loss of time. All carbon papers are lacking in tensile strength to a certain degree and this is particularly true of the lighter weights.

An object of this invention is to overcome the foregoing difficulties.

Further objects will become apparent as the specification proceeds and upon reference to the drawing, in which

Figure 1 is a cross section shown broken and considerably enlarged of an unimpregnated-uncoated sheet;

Figure 2 is a similar section having the color composition applied to one surface in a more or less normal way; and

Figure 3 is a similar section illustrating the product of this invention.

Referring more particularly to the drawing, in which an embodiment of the invention is disclosed for the purposes of illustration, at 10 is

shown an unimpregnated-uncoated base sheet. No attempt has been made to show relative proportions. A coating of a solid plastic color-containing composition 11 is shown applied to the surface 12 of sheet 10.

The color-containing material 11 may be applied in a normal way which results in a substantial degree of impregnation of the sheet 10 illustrated diagrammatically at 13. The composition 11 does not normally fill all of the voids in and between the fibres or, in other words, the impregnation is not normally such as to completely impregnate the paper 10 adjacent the surface 14.

According to this invention, impregnation of the sheet 10 is completed through the surface 14 by the application of a composition which is elastic, resilient, water resistant and preferably waterproof, and which possesses a desired degree of fibre binding ability and good impregnation properties. The composition should be solid at normal temperatures and after evaporation or drying of any solvent present.

I prefer to use as the impregnating material a cellulosic plastic dope, of which the various commercial cellulose nitrate and cellulose acetate lacquers are representative. Besides the cellulose esters, other regenerated cellulosic base compositions such as the cellulose ethers, ethyl cellulose, and butyl cellulose, may be used in association with appropriate plasticizing agents and solvents to form a dope or lacquer that is fluid and applicable by conventional coating methods. The dope, besides containing a cellulose ester or other cellulosic substance as a base, should have a sufficient amount of plasticizer or softener so that the dope when dried will not be characterized by stiffness, such as is present, for instance, in colloidion films, and so that the paper impregnated therewith will have a desired degree of elasticity and resiliency, but at the same time will have more body. The cellulosic base composition will act as a cement between the fibres of the paper. The application of the dope is substantially one of impregnation through the surface 14, although it is possible to leave a very thin continuous film on such surface if desired, provided the dope is of a sufficiently elastic and resilient character to permit proper transfers to be made by the carbon or color coated side upon the striking of the keys of a typewriter.

The dope may be applied by any means known in the art such as by a spray from an air-gun and in any event will be applied sparingly in view of the limited absorptive capacity of the already partially impregnated carbon paper.

Inasmuch as the various cellulosic plastic dopes and the various carbon and other color compositions are as a rule compatible and miscible with each other and are at least to a certain extent soluble in each other, the dope may, if impregnation therewith is carried out to a sufficient extent, penetrate through into the carbon composition and aid in holding the same to the surface <sup>12</sup>.

After application of the dope, its volatile solvent is permitted to evaporate and when dried the impregnated sheet is ready for use.

The cellulosic plastic dope may carry any of the usual coloring matters, such as pigments, dyes and/or lakes for ornamentation or identification purposes, and as a result the surface <sup>14</sup> may be given a uniform color or any color combination.

The finished carbon paper possesses more body without material increase in thickness, whether it is of light, medium or heavy weight, and any increase in thickness is determined by the amount of dope applied.

Inasmuch as the carbon paper possesses more body, which is furnished by a composition having the desired elastic and resilient properties, the tendency to curl and to wrinkle, crinkle or sharply bend during use, either as a result of handling or of striking with the typewriter keys, is greatly reduced, without a reduction in the desired useful properties of such material. As a consequence, a great deal of time is saved in handling of the sheets with improvement in quality of copies and the tendency of the carbon composition to chip or crack off is reduced resulting in a longer useful life for the carbon paper compared to its useful life prior to impregnation with the dope.

The finished carbon paper has a greater tensile strength in view of the cementation of the fibres of the paper sheet, resulting in a greater resistance to tearing. In view of the increased body, the tendency of the light weight carbons to form tree-like impressions is substantially absent.

In view of the substantially complete impregnation of the paper from opposite sides with relatively non-hygroscopic materials,—the cellulosic or other moisture-proofing composition on the one side and the color-carrying marking composition on the other,—the tendency exhibited in ordinary carbon papers to respond to changes in relative humidity is removed.

The carbon paper may be manufactured in the ordinary way by any of the ordinary processes after which the uncoated surface is impregnated with cellulosic dope or equivalent waterproofing and impregnating composition as above indicated. It is, however, possible to impregnate simultaneously from opposite sides of the base with the respective impregnating materials, or otherwise.

I am aware of the fact that it has been proposed to form a manifold sheet from bibulous paper impregnated from one side by a non-drying ink and coated on the reverse side by a thin coating of collodion which serves to prevent the ink from exuding from the back of the sheet. It has also been proposed to apply a pyroxilin solution on one or both faces of a typewriter ribbon to act somewhat as a filter for the purpose of regulating the amount of ink transferred to the paper in the typing operation. The carbon paper of my invention differs from the manifold sheet of the prior art above mentioned in that

a normally solid color composition is applied to the relatively thin and hard non-bibulous paper customarily employed in forming carbon paper. When the water resistant impregnating composition is applied after the color composition is applied, as preferred, my carbon paper has the further difference and advantage that the impregnating composition penetrates into the zone occupied by the color composition with the result that the color is more firmly held onto the paper base, thereby preventing breaking or chipping off under the impact of the type, as happens at present to a more or less degree. The differences in purpose and result between my carbon paper and the typewriter ribbon of the prior art are obvious and would not appear to require discussion.

Having described my invention, it is obvious that many modifications may be made in the same within the scope of the claims without departing from the spirit thereof.

I claim:

1. A process for making manifold sheets comprising coating and impregnating a sheet of paper on and through one of its surfaces with a suitable normally solid carbon-containing color composition and then impregnating said sheet through its other surface with a plasticized cellulose nitrate composition which solidifies on standing, to form a highly flexible impregnation.

2. A process for making manifold sheets comprising coating and impregnating a sheet of paper on and through one of its surfaces with a suitable normally solid carbon-containing color composition and then impregnating said sheet through its other surface with a plasticized cellulose acetate composition which solidifies on standing to form a highly flexible impregnation.

3. A process for making manifold sheets comprising coating and impregnating a sheet of thin non-bibulous paper on and through one of its surfaces with a suitable normally solid carbon-containing color composition and then impregnating said sheet through its other surface with a plastic cellulosic composition which solidifies on standing to form a highly flexible impregnation.

4. A manifold sheet comprising a sheet of thin non-bibulous paper coated and impregnated on and through one surface with a suitable carbon-containing color composition and impregnated through its other surface with a pigment-containing plasticized cellulosic composition which is compatible with the color composition and flexible in its solidified state, said pigment imparting to said other surface a characteristic appearance, said sheet being further characterized by its freedom from tendency to curl and form tree-like impressions on copies, and further characterized by ability to produce sharp impressions even when used in producing a relatively large number of copies simultaneously.

5. A manifold sheet comprising a thin non-bibulous paper base having on its face a coating of a normally solid color composition and having on its back a coating of a plasticized cellulosic composition, said cellulosic composition being compatible with the color composition and flexible in its solidified state, said sheet being further characterized by its freedom from tendency to curl and form tree-like impressions on copies, and further characterized by ability to produce sharp impressions even when used in producing a relatively large number of copies simultaneously.

6. A manifold sheet comprising a thin non-bibulous paper base having on its face a coating of a normally solid color composition and having on its back a coating of a plasticized cellulose nitrate composition, said cellulose nitrate composition being compatible with the color composition and flexible in its solidified state, said sheet being further characterized by its freedom from tendency to curl and form tree-like impressions on copies, and further characterized by ability to produce sharp impressions even when used in producing a relatively large number of copies simultaneously.

bibulous paper base having on its face a coating of a normally solid color composition and having on its back a coating of a plasticized cellulose acetate composition, said cellulose acetate composition being compatible with the color composition and flexible in its solidified state, said sheet being further characterized by its freedom from tendency to curl and form tree-like impressions on copies, and further characterized by ability to produce sharp impressions even when used in producing a relatively large number of copies simultaneously.

7. A manifold sheet comprising a thin non-

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