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INK COMPOSITION

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The ink composition to which this invention is directed, is primarily designed for application to or the impregnation of ink carriers, such as flexible ribbons of absorbent fabric or of other suitable material, or carbon sheets, for use in typewriting machines, registers, printing machines and presses, in wide or narrow lengths.

Recent experiments have been conducted for the purpose of developing a flexible ribbon, not particularly absorptive by nature, such as Cellophane, paper or the like, which carries the ink or impression composition as a coating, and the ink composition hereinafter set forth is applicable to such ribbons, as well as to those composed of absorbent fabric.

Heretofore, in the manufacture of ink for impregnation or coating of ribbons for use in typewriting or other printing machines, it has been customary to grind the selected pigment, as carbon black, for example, with one or more non-drying oils, which experience has taught give the best results.

Some aniline base may be mixed with the above ingredients as a toning agent, if desired, after which the ribbons are coated, impregnated or saturated with the ink thus compounded.

Deterioration, however, occurs in ribbons kept in stock, the ink dries out, and the effective life of the ribbon is materially shortened, which deterioration is not wholly accounted for by the gradual absorption of the ink into the innermost cores of the fibres composing the ink carrier material or fabric, or by evaporation.

Also it is well known that the characteristics of even the more highly refined, non-drying oils of animal or vegetable origin change, upon long exposure to the air, and the oils tend to oxidize, and even become rancid.

Due possibly to such changes, the oils used in compounding ribbon inks always become more fluid in warm weather than in cold weather, so that the ribbons part with their ink content more freely, thus reducing the length of time during which distinct impressions can be made on the record material.

Attempts have been made to overcome this extreme fluidity under higher temperatures, by coating the type side of the ribbon with a layer of material, such as cellulose, or in some cases, powdered metal, but such coatings have no effect on the deterioration of the ink composition itself, and but slight effect in preventing the ink in its more fluid state from excessively depositing on the record material.

In my invention, I have approached these

problems from a different angle, and instead of attempting to control the ink content in its more fluid state, I have sought to prevent the ink from becoming fluid and also to prevent deterioration of the ink through oxidation. Furthermore, the invention results in the production of a more stable ink, the non-drying properties of which are prolonged, to impart extended life to the ribbon. To these ends, I have discovered that the foregoing disadvantages are obviated to all practical purposes, by the use of certain compounds of that group containing tri-cresyl phosphate, which not only eliminates the former objections, but in addition, makes available a ribbon in which the colors are more thoroughly dispersed in the ink; which does not change in character even after long exposure to the air, and which maintains the ink composition at a substantially uniform density notwithstanding wide variations in atmospheric temperatures and degrees of moisture.

As a result, the ink content of a ribbon treated with this new ink compound is gradually exhausted at an even rate while the ribbon is in use, which also tends to prolong the effective life of the ribbon and the impressions are of even intensity, assuming that the impact or pressure of the types is evenly applied, thus achieving the important advantage of eliminating the cause of variations in type impressions at the source, instead of attempting to physically restrain an excess deposit of ink in typing on the work sheet after the ink heretofore compounded, has become unduly fluid.

As an illustration of the use of my improved ink composition, wherein tricresyl phosphate is substituted for the entire oil content heretofore used in ribbon inks as a vehicle for the pigments, the following formula may be taken as an example, which is applicable to ink carriers used in connection with a wide variety of machines, as typewriting and adding machines, Multigraph and other duplicators, printing presses, and the like, the proportions being given by weight.

One such working formula contains

	Parts
Tri-cresyl phosphate.....	55
Oleic acid.....	45
Carbon black or other suitable pigment depending upon the color of ink desired.....	12
Nigrosine or other aniline base as a toning agent.....	8

The foregoing proportions are intended for illustration only, some variation being, of course,

possible in obtaining an ink composition having the advantages mentioned.

It will be noted that the above listed ingredients are all well-known in the manufacture of inks for the purpose stated, with the exception of the tri-cresyl phosphate, which is used as a vehicle for the selected pigments, and which, so far as I am aware, has never been used in the composition of ribbon inks.

The ink, under the above formula, is compounded and applied in the same manner as heretofore; the carbon black or other color pigments being mixed together and ground with the non-drying tricresyl phosphate in a suitable mill, and toned, by mixing therewith a suitable color base, which is soluble in the presence of an oil miscible acid, such as oleic acid.

My improvement contemplates the substitution of tri-cresyl phosphate for part or all of the oil.

As an example of a formula wherein the tri-cresyl phosphate is substituted for a part only of the oils of animal or vegetable origin, I suggest

	Parts by weight
25 Tri-cresyl phosphate.....	50
Castor oil.....	50
Carbon black.....	20
Prussian blue toning base.....	20

the particular proportions given, being subject to some variation.

Tri-cresyl phosphate, by reason of its exceptionally low surface tension and vapor pressure, apparently imparts the best results when commingled with the other ingredients of the ink composition, but other organic esters, as triphenyl phosphate, dibutyl phthalate, diamyl phthalate and diethyl phthalate, having the physical properties of an oil, and the characteristics of low surface tension and low vapor pressure will serve nearly as well, when, like tricresyl phosphate, they are used in quantities sufficient to act as vehicles for the selected pigments.

"Nigrosine" mentioned in the first formula, is the trade name for a base color or aniline dye.

The inclusion of tri-cresyl phosphate or an equivalent compound, to the ink or "dope" with which manifold paper, known as carbon paper, is coated, tends to toughen the "dope" or ink composition, thereby resulting in materially increasing the durability of the sheet or paper in actual service or work.

A sample formula for carbon paper ink or "dope" utilizing my discovery, is

	Parts by weight
55 Petrolatum oil.....	76
Tri-cresyl phosphate, or any equivalent compound having the above enumerated properties and characteristics.....	24
60 Carnauba wax.....	92
Carbon black.....	36
Methyl violet or other toning color.....	7

Obviously, since the transfer coating on manifold sheets is generally made in different degrees of hardness, the proportions of the ingredients of which the carbon ink is compounded vary depending upon the degree of hardness of the coating desired.

Thus, the amount of petrolatum oil, may vary between 64 and 88 parts, more or less, and the amount of carnauba wax used may vary between 80 and 104 parts, more or less, nor do I wish to be understood as restricting the proportions of

tri-cresyl phosphate, carbon black and the toning agent to the exact amounts specified, reasonable variations thereof being permissible.

Petrolatum oil is a mineral oil of light gravity and low viscosity, preferably of the class of very light oils used medicinally. However, other non-drying oils of low viscosity and surface tension may be substituted.

The use of tri-cresyl phosphate effects a better dispersion of the color in the composition, and tends to reduce the liability or tendency of the carbon paper, when in use, to curl due to variations in atmospheric temperature or moisture.

The basic and well known formulae of the prior art for making carbon paper inks or "dopes", utilize hard waxes tempered with oils or petroleum jellies ground with black or other pigments, and toned with color bases or basic colors, the latter being soluble in oils in the presence of organic acids, as oleic acid, for example, and the pigments distinguishable therefrom, by being soluble in water.

In my invention, the ingredient tri-cresyl phosphate or its equivalent, being of an oily nature, is substituted for a part or all of the oil or petroleum jelly usually included to soften or reduce the hardness of the wax.

Conveniently, the ingredients are melted together and then ground on a cold three roller mill, a heated centrifugal or ball mill, or any of the various types of colloid mills. Or according to commercial practice, the various ingredients are weighed out in their respective proportions, and thrown into a suitable grinding mill, as a three roller mill, which thoroughly amalgamates the different materials and disperses the pigment, as carbon black, thoroughly throughout the mass.

Where the ingredients are ground in a heated mill, the heat is held substantially to that degree accordant with a pressure of ten pounds of steam in the heating jacket of the mill. In any case, only sufficient heat is applied to retain the carbon ink in a molten state.

In grinding carbon dope in a three roller mill, the rolls are kept cold and the ink issues from the mill in plastic scales.

The term "base" as used in connection with the words "aniline", "Nigrosine", "color", and "toning" is commonly used in the dye-stuff trade, and has but one meaning, as follows.

There is a class of dye-stuffs, the more important of which are

Crystal and Methyl Violet.....	Purple	55
Victoria Blue.....	Blue	
Victoria Green.....	Green	
Rhodamine.....	Red	
Auramine.....	Yellow	
Nigrosine.....	Black	60

Each of these colors or dye-stuffs is an ester of a complicated organic chemical radical having the corresponding coloring properties.

These dye-stuffs or colors are generally sold as chlorides or zinc chlorides. For example, Methyl Violet is a zinc chloride of penta methyl-para rosaniline.

These dye-stuffs have, in common, the property of being completely and easily soluble in water, and in such solution are used in ordinary dyeing operations, for dyeing paper, and paper pulp, for instance.

If these colors or dye-stuffs in water solution, are treated with an alkali, as soda ash, for ex-

ample, the color precipitates out of the water solution, as a "base", an OH radical replacing the Cl radical, to form water-insoluble, aniline "bases", which are known in the trade as Methyl

5 Violet Base, Nigrosine Base, etc.

When these "base" colors are treated with an acid miscible with oils, as oleic acid, for instance, or other suitable solvent, there is formed a strong, oily solution (oleic acid being regarded chemi-

10 cally as a "fatty acid") of the respective colors, and when used in compounding ribbon inks, the solution strongly dyes the oils or miscible ingredients of such ink compound.

This solution of a base color with an acid miscible with oils is a "toning agent", and has the following purpose.

A ribbon saturated with an ink composed only of an oil or other medium into which is ground carbon black, would give an imprint or "write" dirty brown in color. Therefore, a "toning agent", or aniline "base", as a Nigrosine base, when describing a black toning agent, is added to the carbon black suspended in the tricresyl phosphate vehicle, to develop the extremely

25 strong, rich black imprint demanded of modern typewriter ribbons.

Tri-cresyl phosphate, as one element of a number of hydrocarbon derivatives suitable for use as a control and preservative ingredient in ribbon and carbon paper inks, is well known, and I am aware of its use in connection with other constituents, as a bonding medium employed as an adhesive, wherein it constitutes by comparison, an almost negligible part of the blended

35 composition.

I also am aware of the use of this compound in the manufacture of imitation embossed printing, and in the manufacture of decalcomania-

like transfers, but in none of these prior uses, is the tri-cresyl phosphate or its equivalent used for the purposes set forth in my invention, nor in combination with the kinds of ingredients hereinbefore referred to.

Changes may be made in the proportions set forth, and in the particular preservative hydrocarbon derivative other than those mentioned, without departing from the spirit and scope of my invention, the essence of which resides in the use of a hydrocarbon derivative of the group to which tri-cresyl phosphate, dibutyl-, diamyl- and diethyl-phthalates belong, having an oily nature, with low vapor pressure and low surface tension, as an ingredient of an ink composition for saturating, impregnating or coating ribbons and carbon sheets for use in printing presses, typewriting, adding, and autographic machines and recorders, to maintain the ink substantially uniform in density despite variations in temperature and humidity, and prevent deterioration of the ink due to exposure or age.

What I claim as new, is:—

1. A ribbon ink composed of a pigment; tricresyl phosphate in quantity sufficient to serve as the vehicle in which the pigment is dispersed and held in suspension; a basic color base to intensify and enrich the color of the pigment; and oleic acid to dissolve the basic color base.

2. A ribbon ink composed of the following ingredients by weight; 12 parts of pigment; 55 parts of tricresyl phosphate as the vehicle in which the pigment is held in suspension; and 8 parts of a basic color base dissolved in 45 parts of oleic acid to dye the tricresyl phosphate vehicle and intensify, tone and enrich the color of the mixture.

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