June 14, 1966 E. STRAUSS 3,256,107

TRANSFER SHEET

Filed Sept. 11, 1964 2 Sheets-Sheet 1

FIG. 1A

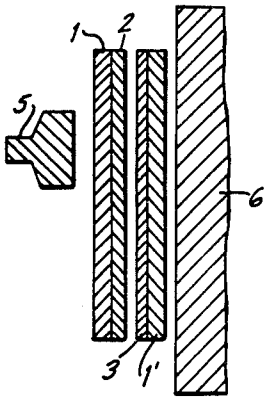


FIG. 1B

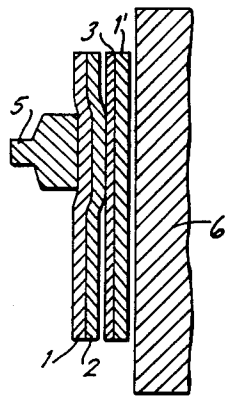


FIG. 1C

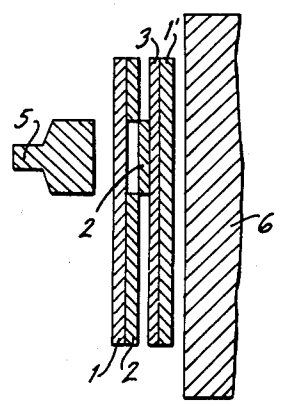


FIG. 2A

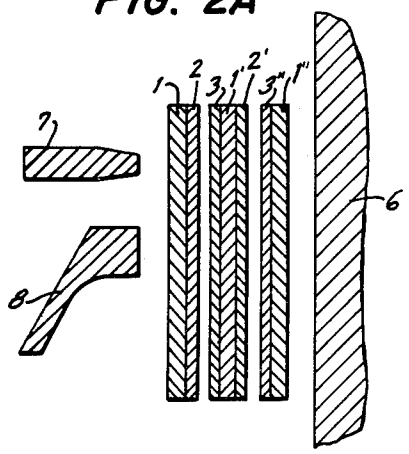
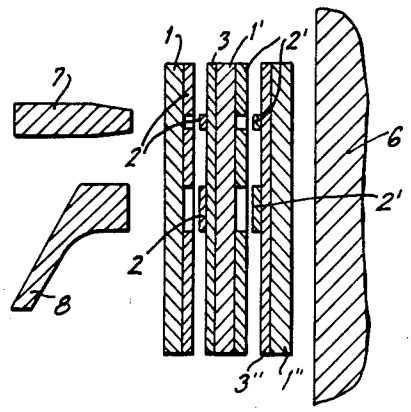


FIG. 2B



1,1'1" = CARRIER SHEETS
2,2',2" = TRANSFER LAYERS
3,3'3 = TAKE UP LAYERS
5, 7, 8, = TYPEWRITER KEYS
6 = SUPPORTING TYPEWRITER ROLLER
9 = BODIES OF TRANSFER LAYER
10 = CANALS

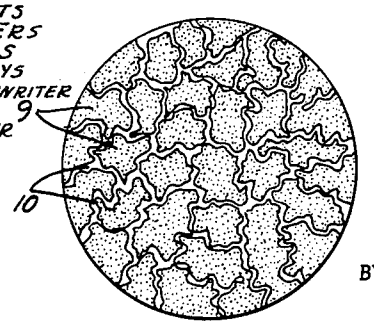


FIG. 3

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June 14, 1966 E. STRAUSS 3,256,107

TRANSFER SHEET

Filed Sept. 11, 1964 2 Sheets-Sheet 2

FIG. 4a

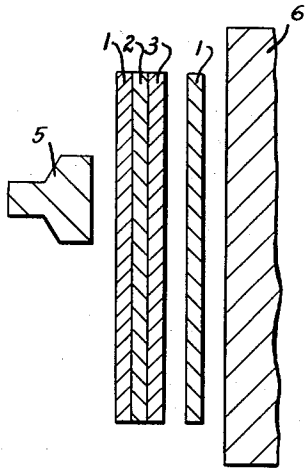


FIG. 4b

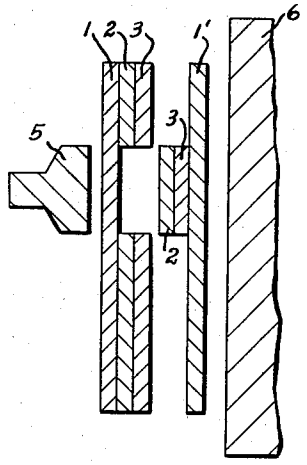
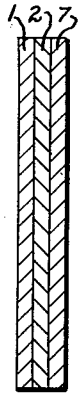


FIG. 5



1,1' = CARRIER SHEETS
2 = TRANSFER LAYER
3 = TAKE UP LAYER
5 = TYPEWRITER KEY
6 = SUPPORTING SURFACE (TYPEWRITER ROLLER)
7 = PROTECTIVE LAYER

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3,256,107

TRANSFER SHEET

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Filed Sept. 11, 1964, Ser. No. 395,948
Claims priority, application Italy, Dec. 23, 1960, 641,897; July 8, 1961, 695,786; Great Britain, Apr. 22, 1963, 36,821/63
The portion of the term of the patent subsequent to February 16, 1982, has been disclaimed
3 Claims. (Cl. 117—36.1)

The present application is a continuation-in-part of my copending application Serial No. 208,529, filed July 9, 1962, now U.S. Patent No. 3,169,880 and entitled "Copy Paper." Application Serial No. 208,529 is a continuation-in-part of application Serial No. 136,711, filed September 5, 1961, and entitled "Copy Paper or the Like" and now abandoned.

The present invention relates to a copy paper and the like, and more particularly, to copy papers which may be used for making in a single operation a plurality of copies without use between the sheets of so-called carbon paper.

Copy papers of the type with which the invention is concerned have a colored transfer layer applied to the rear face of a carrier sheet, the front face of the sheet being coated with a take-up layer adapted to accept the colored transfer layer. By superposing the rear face of one such sheet on the front face of another such sheet and writing on the front face of said one sheet, a copy of the writing is obtained on the front face of the underlying sheet.

In my copending application Serial No. 208,529, the contents of which are incorporated herein by reference, there is disclosed a copy paper having on one face thereof a transfer layer essentially comprising a resinous substance serving as a binding agent, at least one plasticizer therefor, at least one finely divided, preferably colloidal inorganic filler material, and a coloring material, preferably a coloring pigment. The transfer layer includes also an organic fixing agent which assists in providing the transfer layer with a microscopically discrete character so that under substantial local pressure applied to the other face of the copy paper, the transfer layer will transfer locally in its entirety to a take-up layer which consists essentially of a natural or synthetic resin and at least one plasticizer for the same.

Thus, the copy paper or the like disclosed in my copending application Serial No. 208,529 may comprise a carrier sheet provided on one face thereof with a transfer layer consisting essentially of a resinous substance selected from the group consisting of polyvinyl acetate, mixed polymerisates of polyvinyl acetate, colophonium, polymethylacrylate, polymethylmethacrylate, polycarbonates, polystyrene, polychloroprene, styrene-butadiene copolymers, synthetic cellulose resins, cumarone resin and cumaronephenol resins, of an effective amount of at least one plasticizer for the resinous substance, of at least one organic fixing agent in an amount of between about 15–90% of the weight of the resinous substance and selected from the group consisting of tannic acid, phthalic acid, gallic acid, digallic acid, salicylic acid, phenyl salicylate, 4-butyl-phenyl-salicylate, 5-chloro-2-hydroxy-benzophenone, 2,4-dibenzoyl-resorcin, phenol and pyrogallic acid, of at least one inorganic celloidal nonmagnetic substance in an amount of 1.15–1.70 times the weight of the resinous substance plus said plasticizer and selected from the group consisting of bentonite, kaolin, calcium carbonate, calcium sulfate, calcium phosphate and zinc oxide, and of a pigment, and provided on the other face thereof with a take-up layer sensitive to and adapted to receive impressions of said transfer layer, said take-up layer consisting essentially of a dried resinous substance selected from the group consisting of vinyl polymers, ethyl cellulose, benzyl cellulose, methyl cellulose, carboxymethyl cellulose, polydiolefines, diolefine-styrene mixed polymers, polycarbonates, colophonium, copal, abietic-maleic resins and cumarone resins, and of an effective amount of at least one plasticizer in which said resinous substance is soluble, whereby said layer of the type described is adapted to transfer impressions thereto.

It is an object of the present invention to provide copy papers of the aforementioned type which are adapted for use in data-processing machines having magnetic or electric sensing heads.

Other objects and advantages of the present invention will become apparent from a further reading of the description and of the appended claims.

With the above and other objects in view, the present invention contemplates a copy paper or the like, comprising a carrier sheet provided on one face thereof with a transfer layer consisting essentially of a resinous substance selected from the group consisting of polyvinyl acetate, mixed polymerisates of polyvinyl acetate, colophonium, polymethylacrylate, polymethylmethacrylate, polycarbonates, polystyrene, polychloroprene, styrene-butadiene copolymers, synthetic cellulose resins, cumarone resin and cumarone-phenol resins, of an effective amount of at least one plasticizer for said resinous substance, of at least one organic fixing agent in an amount of between about 15–90% of the weight of said resinous substance and selected from the group consisting of tannic acid, phthalic acid, gallic acid, digallic acid, salicylic acid, phenyl salicylate, 4-butyl-phenyl-salicylate, 5-chloro-2-hydroxy-benzophenone, 2,4-dibenzoyl-resorcin, phenol and pyrogallic acid and of at least one inorganic colloidal magnetic material in an amount of 1.15–1.70 times the weight of said resinous substance plus said plasticizer, whereby upon the making of an impression on the opposite face of the carrier sheet when the one face thereof is in contact with a face of a take-up sheet sensitive to and adapted to receive the transfer layer a portion of the transfer layer corresponding to the impression is transferred to and adheres to the take-up sheet, thereby making a copy of the impression thereon.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments, when read in connection with the accompanying drawings, in which:

FIG. 1 (comprising FIGS. 1*a*, 1*b* and 1*c*) is a diagrammatic, cross sectional illustration of the transfer of copy with copy sheets according to one embodiment of the present invention;

FIG. 2 (comprising FIGS. 2*a* and 2*b*) is a diagrammatic, cross sectional illustration of the transfer of copy using copy sheets in accordance with another embodiment of the present invention;

FIG. 3 is an enlarged view looking down at a portion of a transfer layer in accordance with the present invention;

FIG. 4 (comprising FIGS. 4*a* and 4*b*) is a cross sectional illustration of the transfer of copy with copy sheets according to another embodiment of the present invention; and

FIG. 5 is a schematic cross sectional view of a transfer sheet according to the present invention which includes a protective layer covering the free face of the transfer layer.

Referring more particularly to the drawings, and particularly to FIG. 1, a copy paper sheet **1, 2**, comprising a carrier sheet **1** and a transfer layer **2** is placed adjacent a copy paper sheet **1', 3** comprising a carrier sheet **1'** and a take-up layer **3** against a supporting surface **6** which corresponds to the roller of a typewriter. When the typewriter key **5** strikes against the carrier sheet **1, 2** the transfer layer **2** comes in contact with the take-up layer **3** and firmly adheres thereto so as to form the corresponding impression on the copy sheet **1', 3.**

FIG. 2 illustrates the making of copy with three copy sheets in accordance with the present invention. The copy sheet **1, 2** comprising a carrier sheet **1** and a transfer layer **2** is placed adjacent a copy sheet **1', 2', 3** comprising a carrier sheet **1** having on one face thereof a take-up layer **3** and on the other face thereof a transfer layer **2'**, this sheet **1', 2', 3** being placed between sheet **1, 2** and a copy sheet **1'', 3''** comprising a carrier sheet **1''** and a take-up layer **3''**. This assembly of three sheets is placed against a typewriter roller **6** and when the typewriter keys **7** and **8** strike the first sheet the corresponding image from the transfer layer **2** adheres to the take-up layer **3** of the intermediate copy sheet **1', 2', 3,** and the same image **2'** is transferred therefrom to the carrier sheet **1'', 3''** where it adheres to the take-up layer **3''**.

FIG. 3 illustrates that bodies of transfer layer **9** are separated by canals **10** so that the bodies are much like islands. Of course this illustration is greatly enlarged. The effect of the fact that the transfer layer is in the form shown is that the transfer of the image from the transfer layer to a take-up is greatly facilitated.

Referring now to FIGS. *4a* and *4b* of the drawing, the copy sheet **1, 2, 3** comprises a carrier sheet **1**, a transfer layer **2** and a take-up layer **3** arranged in the indicated sequence. A sheet on which copy is to be produced, for instance plain sheet **1'** is interposed between roller **6** of the typewriter and copy sheet **1, 2, 3.** When typewriter key **5** strikes carrier sheet **1**, an image corresponding to the impressed portion of typewriter key **5** will be formed on the free face of carrier sheet **1.** Corresponding portions of transfer layer **2** and take-up layer **1** will be transferred to the adjacent face of plain sheet **1'**, and will form thereon an image consisting, as illustrated in FIG. *4b*, of a portion of transfer layer **2** and of take-up layer **3**, the latter being interposed between plain sheet **1'** and the transferred portion of transfer layer **2.**

It is of course, also possible to replace plain sheet **1'** with one or more copy sheets **1, 2, 3,** so that the free face of the respective carrier sheet is adjacent to the take-up layer of the superposed copy sheet.

FIG. 5 illustrates the embodiment of the present invention, according to which a protective pigment-containing layer **7** is superposed upon transfer layer **2** carried by carrier sheet **1.**

Thus, it has now been found in accordance with the present invention that such copy papers can be adapted for use in data-processing machines having magnetic or electric sensing heads, by the incorporation in the transfer layer of a magnetic or magnetizable material, whereby in the context of the present invention magnetic and magnetizable materials will both be referred to as magnetic materials. Such a material is, for instance, magnetic iron oxide powder. The copies made on the acceptor layer which contain such magnetic material can be used in a data-processing machine having a magnetic or electric sensing head.

The magnetic material may be present in the transfer layer in an amount of from 1.15 to 1.70 times the weight of the resinous substance plus the plasticizers therefor. The magnetic material may be present in the transfer layer in addition to an inorganic filler material, or the magnetic material may itself act as the sole filler material for the transfer layer.

The plastic binding agents or resinous substances, plasticizers, coloring materials and, when used, the inorganic fillers and organic fixing agents which may be used in the transfer layer may be the same as those described in my copending application Serial No. 208,529. Furthermore, the transfer layer, may contain, if desired, a material which softens the layer without having a solvent action thereon, for example castor oil or recinoleic acids.

The magnetic or magnetizable material may be iron powder, cobalt powder or nickel powder, or Fe_3O_4 (magnetite), commercially available as "Magnet pigment LK (BASF)" or "Magnet pigment ZM (BAEYER)" or gamma-Fe_2O_3, commercially available "Magnet pigment S–12 (BAEYER)," or mixtures thereof.

The maximum particle size of the magnetic material should be about 1 micron, however, it is desirable to use particles of the smallest available size. Very good results are obtained with the above described Magnet-pigment S–12, which has a particle size of 0.1 micron.

The resinous substance may be any of the resinous substances which were mentioned above and which are described in more detail in my copending application Serial No. 208,529.

The magnetic material may be present in the transfer layer in an amount of from 1.15 to 1.70 times the amount of the resinous substance plus the plasticizer therefor. However, it is also possible to use a mixture of a magnetic material and of nonmagnetic inorganic colloidal substances such bentonite, kaolin, calcium carbonate, calcium sulfate, calcium phosphate and zinc oxide, in which case the magnetic material preferably should be present in an amount of at least 1.15 times the weight of the resinous substance plus the plasticizer and the combined amount of the magnetic material and the inorganic nonmagnetic substance should be up to 1.70 times the weight of the resinous substance plus plasticizers therefor.

The term "colloidal" is intended to indicate a particle size of up to about 1 micron.

The resinous substance preferably is selected from the group consisting of polyvinyl acetate, colophonium, mixed polymerisates of polyvinyl acetate, polymethylacrylate, polymethylmethacrylate, polycarbonate, polystyrene, polychloroprene, styrene-butadiene copolymers, synthetic cellulose resins, cumarone resin and cumarone-phenol resins. The amount of resinous substance preferably will be between 4 and 20% of the weight of the transfer layer and most preferably between 5 and 10% of the weight thereof.

As plasticizers may be used castor oil, dibutylphthalate, dioctylphthalate, diamylphthalate, tricresylphosphate, cyclohexyl-p-toluenesulfonamide, dioctylsebacate, dibutylstearate, tributylphosphate, ricinoleic acid, castor oil and the like, and preferably the plasticizer will be present in an amount equal to between the amount by weight of the resinous substance and 4.5 times that much.

As organic fixing agent, tannic acid, phthalic acid, gallic acid, digallic acid, salicylic acid, phenyl salicylate, 4-butyl-phenyl-salicylate, 5-chloro - 2 - hydroxy-benzophenone, 2,4-dibenzoyl-resorcin, phenol and pyrogallic acid may be used, as more fully described in my copending application Serial No. 208,529. The amount of the organic fixing agent preferably will be equal to between 15 and 90% of the weight of the resinous substance.

The following examples are given as illustrative only, the present invention, however, not being limited to the specific details of the examples.

EXAMPLE I

A solution A is prepared from four parts of polyvinyl acetate of molecular weight 60,000 in 100 parts of trichloroethylene as solvent. There is also prepared in a three cylinder machine a paste B consisting of 29% methylglycol, 23% carbon black peerless 155, 31% magnetic pigment LK (Magnetite), dibutylphthalate, and 0.3% Duomeen T-dioleate. Duomeen T-dioleate is an N-alkyl trimethylane diamine prepared from a high molecular weight aliphatic amine and sold by Armours Chemical Ltd. It acts as a dispersing agent.

All percentage figures herein are percent by weight.

The raffinate paste B is stirred with the solution A in a ratio of 31% of paste B and 69% of solution A until a homogeneous copying ink is obtained. The resulting mass is then applied to a carrier sheet. The application is carried out in conventional manner and the drying and self-fixation can be carried out by passing a stream of air tangentially against the self-fixing transfer layer applied to the carrier sheet. The transfer layer is applied to a paper sheet weighing 40 grams per square meter at a rate such that the dry transfer layer will weigh about 6 grams per square meter.

A take-up layer suitable for use with the foregoing transfer layer can be made from 70% by weight of polyethylene, 20% by weight of stearic acid and 10% by weight of paraffin wax. However, any of the take-up layers described in more detail in my copending application Serial No. 208,529 may also be employed.

EXAMPLE II

A transfer layer composition is prepared in the same manner as described in Example I and applied to a carrier sheet. However, instead of a solution A, a solution C is prepared consisting of 2.5 parts of polyvinyl acetate, 0.7 part of tannic acid, and 50.5 parts of 94% alcohol. Furthermore, instead of the paste B a paste D is prepared consisting of 2.5% carbon black peerless 155, 39% magnetic pigment S–12 (gamma-Fe_2O_3), 18% china clay, 13% dibutylphthalate, 13.5% caster oil and 14.0% n-butylacetate.

The final mass consists of 46% of the paste D and 54% of the solution C, and the transfer layer is obtained after evaporation of the solvent.

EXAMPLE III

A transfer layer composition is prepared in the same manner as in Example I, and applied to a carrier sheet. However, instead of solution A, a solution E is prepared consisting of 4 parts of polyvinyl acetate, 1 part of tannic acid and 75 parts of 94% alcohol, and instead of the paste B a paste F is prepared consisting of 5.5% carbon black peerless 155, 34.5% magnetic pigment S–12, 19.5% china clay, 15.0% dibutylphthalate, 12.0% castor oil and 13.5% methylglycol. The final mass of the transfer layer consists of 46% of the paste F and 54% of the solution E, and the transfer layer is obtained after evaporation of the solvent.

EXAMPLE IV

A transfer layer composition is prepared in the same manner as described in Example I and applied to a carrier sheet. However, instead of solution A, a solution G is prepared, consisting of 4 parts of polyvinylacetate, and 100 parts of 94% alcohol (methyl or ethyl alcohol or denatured ethyl alcohol), and instead of paste B a paste H is prepared consisting of 5.7% carbon black peerless 155, 53.5% magnetic pigment S–12, 13.4% methylglycol, 12.9% dibutylstearate, and 14.5% caster oil.

The transfer layer mass will consist of 44% of the paste H and 56% of the solution G and the transfer layer is obtained upon coating of a carrier sheet with the transfer layer mass and evaporation of the solvent.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features, that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A copy paper or the like, comprising a carrier sheet provided on one face thereof with a transfer layer consisting essentially of a resinous substance selected from the group consisting of polyvinyl acetate, mixed polymerisates of polyvinyl acetate, colophonium, polymethylacrylate, polymethylmethacrylate, polycarbonates, polystyrene, polychloroprene, styrene-butadiene copolymers, synthetic cellulose resins, cumarone resin and cumarone-phenol resins, of an effective amount of at least one plasticizer for said resinous substance, of at least one organic fixing agent in an amount of between about 15–90% of the weight of said resinous substance and selected from the group consisting of tannic acid, phthalic acid, gallic acid, digallic acid, salicylic acid, phenyl salicylate, 4-butyl-phenyl-salicylate, 5 - chloro-2-hydroxy-benzophenone, 2,4-dibenzoyl-resorcin, phenol and pyrogallic acid, of at least one inorganic colloidal magnetic material in an amount of at least 1.15 times the weight of said resinous substance plus said plasticizer and selected from the group consisting of metallic iron, cobalt and nickel, Fe_3O_4 and gamma Fe_2O_3, whereby upon the making of an impression on the opposite face of said carrier sheet when said one face thereof is in contact with a face of a take-up sheet sensitive to and adapted to receive said transfer layer a portion of the transfer layer corresponding to said impression is transferred to and adheres to said take-up sheet, thereby making a copy of said impression thereon.

2. A copy paper or the like, comprising a carrier sheet provided on one face thereof with a transfer layer consisting essentially of a resinous substance selected from the group consisting of polyvinyl acetate, mixed polymerisates of polyvinyl acetate, colophonium, polymethylacrylate, polymethylmethacrylate, polycarbonates, polystyrene, polychloroprene, styrene-butadiene copolymers, synthetic cellulose resins, cumarone resin and cumarone-phenol resins, of an effective amount of at least one plasticzer for said resinous substance, of at least one organic fixing agent in an amount of between about 15–90% of the weight of said resinous substance and selected from the group consisting of tannic acid, phthalic acid, gallic acid, digallic acid, salicylic acid, phenyl salicylate, 4-butyl-phenly-salicylate, 5-chloro-2-hydroxy-benzophenone, 2,4-dibenzoyl-resorcin, phenol and pyrogallic acid, of at least one inorganic colloidal magnetic material in an amount of 1.15–1.70 times the weight of said resinous substance plus said plasticizer and selected from the group consisting of metallic iron, cobalt and nickel, Fe_3O_4 and gamma-Fe_2O_3, and of a coloring pigment, whereby upon the making of an impression on the opposite face of said carrier sheet when said one face thereof is in contact with a face of a take-up sheet sensitive to and adapted to receive said transfer layer a portion of the transfer layer corresponding to said impression is transferred to and adheres to said take-up sheet, thereby making a copy of said impression thereon.

3. A copy paper or the like, comprising a carrier sheet provided on one face thereof with a transfer layer consisting essentially of a resinous substance selected from the group consisting of polyvinyl acetate, mixed polymerisates of polyvinyl acetate, colophonium, polymethylacrylate, polymethylmethacrylate, polycarbonates, polystyrene, polychloroprene, styrene-butadiene copolymers, synthetic cellulose resins, cumarone resin and cumarone-phenol resins, of an effective amount of at least one plasticizer for said resinous substance, of at least one organic fixing agent in an amount of between about 15–90% of the weight of said resinous substance and selected from the group consisting of tannic acid, phthalic acid, gallic acid, digallic acid, salicylic acid, phenyl salicylate, 4-butyl-phenyl-salicylate, 5-chloro-2-hydroxy-benzophenone, 2,4-dibenzoyl-resorcin, phenol and pyrogallic acid, of at least one inorganic colloidal magnetic material in an amount at least 1.15 times the weight of said resinous substance plus said plasticizer and selected from the group consisting of metallic iron, cobalt and nickel, Fe_3O_4 and gamma Fe_2O_3, of at least one inorganic nonmagnetic colloidal substance selected from the group consisting of bentonite, kaolin,

calcium carbonate, calcium sulfate, calcium phosphate and zinc oxide, the combined amount of said magnetic material and said inorganic non-magnetic colloidal substance being up to 1.70 times the weight of said resinous substance plus said plasticizer, and of a pigment, whereby upon the making of an impression on the opposite face of said carrier sheet when said one face thereof is in contact with a face of a take-up sheet sensitive to and adapted to receive said transfer layer a portion of the transfer layer corresponding to said impression is transferred to and adheres to said take-up sheet, thereby making a copy of said impression thereon.

References Cited by the Examiner

UNITED STATES PATENTS

2,912,344	11/1959	Newman et al.	117—36.4
3,061,454	10/1962	Graf et al.	117—36.1

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