Nov. 8, 1938. J. Q. SHERMAN ET AL 2,135,538

NONTRANSFER MANIFOLDING MATERIAL

Filed Oct. 17, 1936

Fig. 1

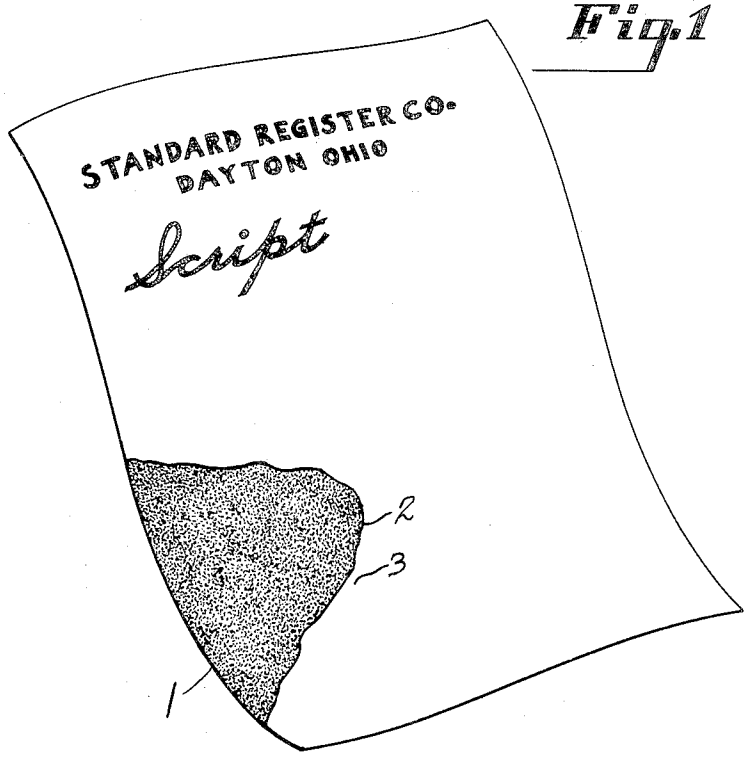
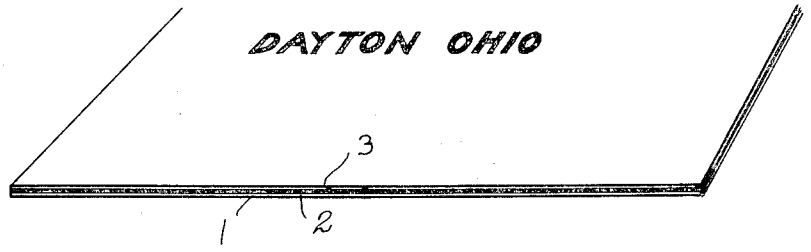


Fig. 2



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NONTRANSFER MANIFOLDING MATERIAL

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18 Claims. (Cl. 282—28)

This invention comprises a non-transfer, thermally responsive, writing material suitable for both manifolding purposes and making of original records.

There exists objection to the use of interleaved transfer sheets for manifolding purposes, not only because of increased expense and the additional operations of interleaving the transfer material between the record sheets preparatory to use and subsequently stripping them therefrom, but also due to tendency of the material to rub off and smudge adjacent sheets and soil the operator's fingers and other surfaces with which it may come in contact. While the use of carbon-backed record material obviates the necessity for transfer interleaving and stripping operations, it is equally as objectionable for the other reasons mentioned.

The present material overcomes these objections by providing a surface coated sheet which will be inert and unimpressionable at the ordinary temperatures prevailing at the point of use and which becomes susceptible to written or imprinted indicia only when preconditioned by subjection to an appreciably higher temperature. The base or supporting sheet and the thermally responsive surface coating are of a distinctly different color. Normally the surface coating is immovably fixed and resistant to writing or imprinting impressions. However, when subjected to a preconditioning temperature such coating material becomes sufficiently plastic or movable to be displaced by pressure of a pencil, stylus, or imprinting member whereby the underlying differently colored stratum is exposed through the written or imprinted displacement area thereby defining the inscribed indicia.

The use of an overlying surface coating which is displaced by writing or imprinting pressure to disclose character outlines by exposure of an underlying differently colored stratum is shown and described in United States Letters Patent to Mayer et al. No. 1,783,442, of December 2, 1930, wherein, however, the coating is not normally resistant or fixed but is subject at all times to pressure marks and abrasion.

By making the surface coating of a normally impression resistant, inert character, which is susceptible of receiving inscriptions only under abnormal conditions, the material is protected against accidental marks and against changes of the inscribed matter. After material which has been conditioned for receiving inscriptions has cooled to normal atmospheric or room temperature prevailing at the point of use subsequently to inscription, the record becomes substantially indelible and again inert and non-responsive to ordinary writing and imprinting operations. Such characteristic obviates any tendency to become sticky or tacky and enables the use of the material in various automatic recording and writing machines.

The object of the invention is to provide a writing material adapted to receive permanent substantially indelible record indicia either directly or manifolded, which may be economically manufactured, and which will be normally inert and insusceptible to markings and record impressions, but which may be rendered receptive thereto by a temporary preconditioning operation subsequent to which the material will again return to its normal inert state.

Referring to the accompanying drawing,

Fig. 1 is a perspective view of a portion of a record sheet embodying the present invention, which has been inscribed to form characters by exposure of restricted areas of the underlying colored stratum and from a portion of which the surface coating has been removed to disclose a more extensive area of the underlying colored stratum.

Fig. 2 is an exaggerated sectional view thereof.

The base or supporting sheet 1 may comprise paper or any other suitable material which may be of any desired color. The color stratum 2 may be a permanent surface coating applied to the base sheet 1 but the color material is preferably incorporated in the sheet during manufacture as is common in the paper industry. To the contrary, the base sheet may be plain white paper in which case the surface coating 3 will be contrastingly colored, and inscribed indicia will appear as white letters upon a dark ground.

The preferred mode of manufacture is to coat a black sheet or one of other dark color with a white or light colored surface coat whereby subsequent displacement of the light colored surface material will produce dark characters upon a white or other light colored ground.

For illustrative purposes, but with no intent to unduly limit the scope or application of the invention, the preferable coating material comprises a finely divided pigment such as titanium dioxide or zinc oxide, if the material is to comprise a white coating upon a dark substratum, which which is combined an organic solvent of which ethyl acetate or ethylene dichloride are suitable materials and a synthetic resin having characteristics of chlorinated biphenyl or polyvinylacetate. The following is a typical and

workable formula for such normally inert thermally responsive white coating material:

	Per cent
Res'n (chlorinated biphenyl)	6.76
Pigment (titanium dioxide)	17.74
Solvent (ethyl acetate)	75.50

In event a colored surface is desired, other pigment of the desired color or shade contrasting with that of the substratum is substituted for titanium dioxide, or dye material may be added to the above coating material formula to produce the desired shade. While the foregoing formula of the preferred coating material affords a very satisfactory and commercially workable mixture, the proportions of ingredients therein mentioned may be varied, the particular percentage thereof being noncritical within a reasonable range.

The resinous material serves as a binder for the opaque covering material of which titanium oxide is illustrative while ample volatile solvent is employed to make the mixture flowable or sufficiently fluid for use in a coating machine or spray gun, after which the solvent is permitted to evaporate. In lieu of titanium oxide as a filler or covering material, other finely opaque material, such as talc may be employed, which may be dyed any desired shade. Likewise, metallic powders such as aluminum and bronze powder may be used as both covering and coloring material.

The composition of the surface coating may be varied so that the coating is normally inert and impression resisting in its unconditioned state at temperatures in accordance with the particular atmospheric or mean annual temperature prevailing at the point of use, and may be conditioned for receiving impressions by a relatively slight temperature rise. More specifically, a writing material to be used in the frigid zones would embody a composition which might well be mobile in the temperate or torrid zones but would be inert and impression resisting at the atmospheric or mean annual temperatures prevailing in the frigid zones; and writing material to be used in the temperate or torrid zones would embody a composition which would be inert and impression resisting at the atmospheric or mean annual temperatures prevailing in those particular zones.

The coating material may be applied by any paper coating method utilizing such apparatus as is customary in the paper industry or by the process of manufacture of carbon coated transfer material. In lieu thereof, such coating material in solution may be sprayed onto the paper base while either cold or hot by a spray gun.

The application of heat to the coated material softens the surface coating without making it fluid, in which condition it merely pushes aside or is displaced by writing or imprinting pressure thereby exposing the substratum of contrasting color throughout the impressed areas. The coated material may be heated approximately to its kindling point without obliterating or destroying the impressed record which becomes permanent, and to such extent heat resistant.

While various methods of subjecting the material to preconditioning temperatures may be employed, the present thermally responsive nontransfer material is especially adapted for use in apparatus such as is shown and described in copending applications, Serial No. 708,631, filed January 27, 1934, and resulting in Patent No. 2,057,696, and Serial No. 77,722, filed May 4, 1936, for Thermal manifolding apparatus.

It is to be understood that the hereinmention of specific materials is for illustrative purposes only, without intent to unduly restrict or limit the scope or application of the invention that other synthetic resins, natural resins and analogous materials having substantially the normal pressure resistant, thermally responsive general characteristics of chlorinated biphenyl or poly vinylacetate may be used as binder material; that comminuted opaque materials other than those mentioned having the desired color or which are susceptible to dye treatment to afford the desired color may be used as cover or filler material; and that the substratum may be a colored sheet wherein the color material is incorporated in the sheet or applied thereto as a thermal resistant coating all of which are within the contemplated scope of the present invention.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described our invention, we claim:

1. A writing sheet including a stratum of normally impression resisting material susceptible to selected area displacement by pressure when preconditioned by a temperature rise and retaining its form in preconditioned areas not subjected to displacement pressure, and a substratum of differently colored material restricted areas of which are exposed in delineation of characters by displacement of like areas of the overlying stratum by pressure.

2. A record sheet for indicia including superposed strata of distinctively colored materials, the overlying stratum comprising an opaque substance normally resistant to displacement pressures at atmospheric temperatures prevailing at the point of use and subject to preconditioning by subjection to a temperature higher than the atmospheric temperature prevailing at the point of use whereby restricted areas thereof are subject to displacement by writing or imprinting pressure to expose corresponding areas of the substratum in delineation of characters, the overlying stratum being of a nature to retain its form in preconditioned areas not subjected to displacement pressure, said material reverting to normal condition leaving the characters substantially indelibly defined upon return to the prevailing atmospheric temperature.

3. The herein described method of recording indicia including the steps of superposing upon a stratum of colored material a second stratum of differently colored thermally responsive material normally resistant to writing and imprinting

pressures and of a nature to retain its form in areas affected by thermal change but not subjected to writing or imprinting pressures, applying heat to an extended area of the superposed strata to precondition the overlying stratum for displacement, causing displacement of restricted areas of the overlying stratum thereby disclosing correspondingly restricted areas of the differently colored substratum in delineation of characters, and causing the material to cool thereby fixing the overlying stratum in such character disclosing relation.

4. A writing material including a colored supporting sheet and a surface coating thereon of normally inert impression resistant material responsive to conditioning by heat whereby the coating is rendered mobile under writing and imprinting pressure to expose the underlying differently colored sheet throughout restricted areas by which character delineation is effected, the coating retaining its form in conditioned areas not subjected to writing or imprinting pressure.

5. As an article of manufacture, a writing material including superimposed strata, one of which is opaque and normally unsusceptible to fracture and relative displacement but rendered susceptible thereto by suitable preconditioning whereby selected areas thereof may be displaced to define indicia on the stratum associated therewith, the coating retaining its form in preconditioned areas not subjected to fracture and displacement.

6. As an article of manufacture, a writing material including superimposed strata of different colors, one stratum of which is normally unsusceptible to fracture or relative displacement but rendered susceptible thereto by suitable preconditioning whereby selected areas thereof may be displaced to define indicia on the stratum associated therewith and of the color of such associated stratum, the coating retaining its form in preconditioned areas not subjected to fracture and displacement.

7. The method of producing an impression receiving record material which comprises superimposing a stratum of opaque material normally unsusceptible to fracture or relative displacement on a sheet, and rendered susceptible to fracture and relative displacement by a suitable preconditioning process whereby selected areas thereof may be displaced to expose restricted areas of the sheet in delineation of characters with the preconditioned area not subjected to fracture and displacement retaining its unconditioned form.

8. The method of producing an impression receiving record material which comprises superimposing on a colored sheet a differently colored stratum of material normally unsusceptible to fracture or relative displacement and rendered susceptible thereto by a suitable preconditioning process whereby selected areas of the stratum of superimposed material may be displaced to expose restricted areas of the differently colored sheet in delineation of characters while retaining its unconditioned form in preconditioned areas not subjected to fracture and displacement and subject to return to its normal condition upon secession of the preconditioning process, leaving the areas of the differently colored sheet exposed.

9. The method of producing an impression receiving record material which comprises superimposing an opaque stratum of thermally responsive material normally unsusceptible to fracture or relative displacement on a sheet, and rendered susceptible to displacement by the application of heat thereto whereby selected areas thereof may be displaced to expose restricted areas of the sheet in delineation of characters while retaining its unconditioned form in preconditioned areas not subjected to fracture and displacement, and subject to return to its normal condition when heat is withdrawn therefrom.

10. The method of producing an impression receiving record material which comprises superimposing on a sheet of one color a stratum of thermally responsive material of another color which is normally unsusceptible to fracture or relative displacement and rendered susceptible to displacement by the application of heat thereto whereby selected areas thereof may be displaced to expose restricted areas of the differently colored sheet in delineation of characters while retaining its unconditioned form in preconditioned areas not subjected to fracture and displacement.

11. The method of producing an impression receiving record material which comprises superimposing an opaque stratum of material normally unsusceptible to fracture or relative displacement at atmospheric temperatures prevailing at the point of use on a sheet, and rendered susceptible to displacement by subjection to a rise in temperature beyond the prevailing atmospheric temperature whereby selected areas thereof may be displaced to expose restricted areas of the sheet in delineation of characters while retaining its unconditioned form in preconditioned areas not subjected to fracture and displacement and of a nature to regain its normal condition on return to prevailing atmospheric temperatures.

12. The method of producing an impression receiving record material which comprises superimposing an opaque stratum of material normally unsusceptible to fracture or relative displacement at atmospheric temperatures prevailing at the point of use on a sheet, and rendered susceptible to displacement by subjection to a rise in temperature beyond the prevailing atmospheric temperature whereby selected areas thereof may be displaced to expose restricted areas of the sheet in delineation of characters while retaining its unconditioned form in preconditioned areas not subjected to fracture and displacement.

13. The method of recording indicia comprising applying to a supporting sheet of distinctly different color a stratum of opaque material normally unsusceptible to fracture or relative displacement but rendered susceptible thereto by suitable preconditioning superimposed thereon while retaining its unconditioned form in preconditioned areas not subjected to fracture and displacement, preconditioning the superimposed stratum and then displacing selected areas of the conditioned stratum to expose restricted areas of the underlying sheet in delineation of characters.

14. A writing material including a sheet having a stratum of thermally responsive, normally impression resisting material thereon susceptible to selected area displacement by pressure when preconditioned by temperature rise, and retaining its form in preconditioned areas not subjected to displacement pressure.

15. A writing material including a sheet having a stratum of thermally responsive, normally impression resisting material thereon susceptible to selected area displacement by pressure when preconditioned by temperature rise, and retaining its form in preconditioned areas not subjected to displacement pressure, said stratum including a resinous binder, an opaque material and a solvent.

16. A writing material including a sheet having

a stratum of thermally responsive, normally impression resisting material thereon susceptible to selected area displacement by pressure when preconditioned by temperature rise, and retaining its form in preconditioned areas not subjected to displacement pressure, said stratum including a mixture made up of approximately 7% of resinous binder material, 18% of opaque material, and 75% of a suitable solvent.

17. A writing material including a sheet having a stratum of thermally responsive, normally impression resisting material thereon susceptible to selected area displacement by pressure when preconditioned by temperature rise, and retaining its form in preconditioned areas not subjected to displacement pressure, said stratum including resin, a pigment, and a solvent.

18. A writing material including a sheet having a stratum of thermally responsive, normally impression resisting material thereon susceptible to selected area displacement by pressure when preconditioned by temperature rise, and retaining its form in preconditioned areas not subjected to displacement pressure, said stratum including approximately one part of resin, three parts of pigment, and a solvent.

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