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D. A. NEWMAN ET AL
SUPERCOATED TRANSFER ELEMENTS

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Fig. 1

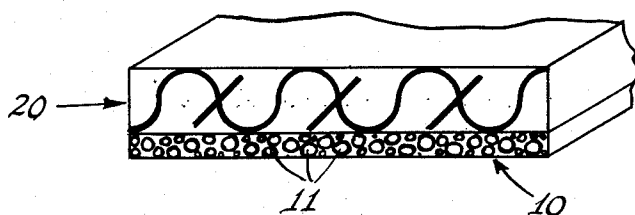


Fig. 2

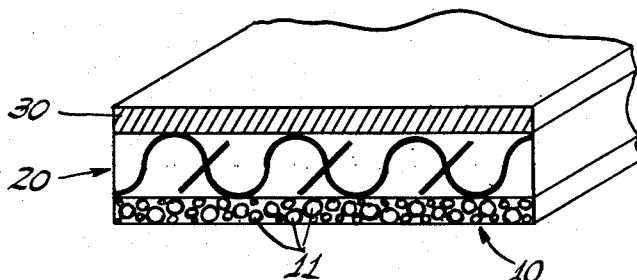
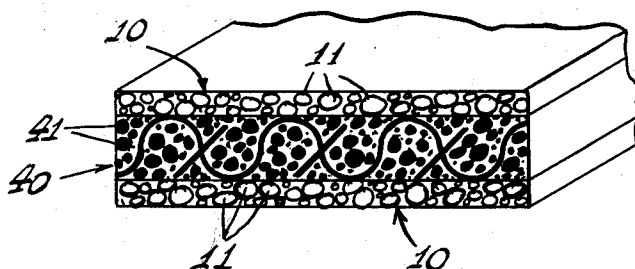


Fig. 3



INVENTORS
Douglas A. Newman
Allan T. Schlottzhauer
BY

Johnson and Kline
ATTORNEYS

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SUPERCOATED TRANSFER ELEMENTS

Douglas A. Newman, Glen Cove, and Allan T. Schlottz-hauer, Locust Valley, N.Y., assignors to Columbia Ribbon and Carbon Manufacturing Co. Inc., Glen Cove, N.Y., a corporation of New York

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The present invention is concerned with novel, clean, long-life transfer ribbons and the method of their production.

Typewriter ribbons are the most commonly employed transfer media in use today. However, conventional ribbons are recognized to have numerous disadvantages and it is an object of the present invention to overcome many of these disadvantages.

Conventional typewriter ribbons are very dirty to the touch. Thus, in removing a used ribbon from a typewriter and installing a new one, the hands of the typist become greatly soiled due to exposed ink on the ribbon. This soil in turn is unintentionally transferred to the typewriter keys and to the work being done, etc.

Another disadvantage is encountered in attempting to produce ribbons which have a relatively long life. The ribbon must contain an excess of ink. However, when a large amount of ink is used it gives rise to many problems. The ribbon produces excessively-inked images which tend to smudge and spread on the sheet. Also, excess ink on the ribbon tends to accumulate on the ribbon guides of the typewriter due to abrasion and fall onto the work or the roller, etc.

Still another disadvantage encountered in the production of fabric textile typewriter ribbons arises from the fact that they are generally produced as wide webs which are thereafter cut into strips. Care must be taken that the ribbon edges are heat sealed or otherwise treated to insure uniform thickness across the ribbon and to prevent uneven edges.

It is an object of the present invention to produce transfer ribbons which are exceedingly clean to the touch but which nevertheless have a very long life and write uniformly and sharply.

It is a further object of the preferred form of the present invention to prepare ribbons of fabric textile which do not require the extra step of sealing their edges.

Other important advantages of this invention will be clear to those skilled in the art, as will the particular nature of the present invention, upon consideration of the detailed description set forth herein.

In the drawing:

FIGURES 1 through 3 are fragmentary perspective views of different forms of typewriter ribbons prepared according to the present invention.

The objects of the present invention are accomplished by overcoating an inked ribbon of the textile fabric type on at least one surface with a porous, spongy, honeycomb layer comprising a synthetic resin, non-volatile, non-solvent material, and, if desired, an amount of coloring matter. It has been found that this supercoating, even where pigmented itself, is very clean to the touch since it is porous and, apparently due to capillary action, holds the ink and non-volatile, non-solvent material within its pores to provide a substantially ink-free surface. Secondly, although the supercoating acts as a protective coating, it transmits ink from the inner textile fabric ribbon to a copy sheet under the pressure of a type bar, provided that the ink composition of the textile ribbon and the composition of the supercoating are formulated according to the description set forth hereinbelow.

Referring to the drawing, FIG. 1 depicts an inked textile fabric ribbon 20 having the porous, protective ink-

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transmitting layer 10 on only one surface. Layer 10 is microporous, containing within the pores 11 thereof non-volatile material, such as mineral oil, which is a non-solvent for the synthetic resin which constitutes the honeycomb or foundation of layer 10. In addition to this non-volatile material, pores 11 may also carry coloring matter, if desired, to provide additional writing strength and give longer life to the total ribbon.

FIG. 2 depicts another, and presently preferred, form of typewriter ribbon prepared in accordance with the present invention. In this form, a conventionally-inked textile fabric ribbon 20 is supercoated on one surface with a porous, protective, ink-transmitting coating 10. As above, this coating comprises a honeycomb or foundation of synthetic resin material having pores 11 therein containing a non-volatile material, such as mineral oil, which is a non-solvent for the synthetic resin material employed, and coloring matter if desired. The opposite surfaces of the ribbon bears a protective, continuous, ink non-transmitting layer 30 to prevent back transfer of ink to the type bars.

FIG. 3 shows a typewriter ribbon 40 prepared by ink-ing a textile fabric ribbon with a pore-forming resinous ink composition which results in the body of the ribbon being impregnated therewith and containing micropores 41 which carry non-volatile, non-solvent material and pigment or dye. The thus inked ribbon is then supercoated on both sides with pore-forming resinous composition, preferably devoid of pigment or dye, to form an exceptionally clean and long life ribbon having a supercoating 10 carrying micropores 11 having therein non-volatile, non-solvent material which is the same as, or at least compatible with, the non-volatile, non-solvent material in pores 41 of the ribbon.

The present invention is applicable to all types of textile fabric ribbons whether they are of the woven or matted type. Conventional ribbons formed from cotton, silk, nylon, felt or any of the other textile fabrics which act as reservoirs for ink compositions may be treated according to the method set forth hereinbelow. However, the ink composition with which the body of the textile fabric ribbon is impregnated, prior to application of the supercoating, must be carefully controlled. It is essential that the non-volatile vehicle of this ink composition contain no material which is a solvent for the synthetic resin material of the supercoating. The use of such solvent materials as dibutyl phthalate or tricresyl phosphate as vehicles, softeners or carriers in the ink composition tends to destroy the porous character of the supercoating, sealing it and rendering it ink non-transmitting. It must be understood, however, that the ink composition of the textile fabric ribbon will vary depending upon the nature of the synthetic resin material used in the supercoating, variations being well within the skill of the artisan. It has also been found to be important that the carrier or softener of the ink composition in the body of the fabric ribbon be compatible and miscible with the non-volatile material carried within the pores of the supercoating. For instance, excellent results are obtained where the ink carrier of the fabric ribbon and the non-volatile ingredient of the supercoating are both oils, and preferably the same oil such as mineral or vegetable oil. The ink composition with which the ribbon is initially treated may comprise any of the conventional ribbon inking compositions presently in use, with the solubility and compatibility limitation discussed above, or else the ribbon inking composition may comprise the same composition employed as the porous supercoating. For instance, the ribbon may be inked with a composition as set forth in our U.S. Patent No. 2,820,717 and passed through rollers prior to evaporation of the solvents. This causes uniform impregnation of the ribbon and results in the ribbon 40

impregnated with a porous honeycomb ink layer having ink-containing pores 41 as shown by FIG. 3 of the drawing. In this embodiment, preferably the supercoating layer 10 contains no coloring matter within its pores 11.

It should be understood, however, that where it is desired to impregnate the ribbon with the pore-forming ink composition, such composition may be selected from any of the pigmented supercoating compositions named and varied greatly as may the supercoating composition.

Broadly speaking, the supercoating composition comprises a resinous pore-forming material together with a non-volatile component which is a non-solvent for the resin and, if desired, pigment or dye, whereas if the ribbon is impregnated with pore-forming ink composition, rather than a conventional ink composition, this composition always contains pigment or dye.

As the resin of the pore-forming compositions which set to a porous, spongy layer, unsaturated polymers such as polyvinyl chloride, polyvinyl fluoride, polyvinyl acetate, vinyl chloride-vinyl acetate copolymers of the Vinylite series such as Vinylite VYHH, polyvinyl butyral, polyacrylic acid, polystyrene, polyvinylidene chloride (Saran), and others; hydrocarbon polymers such as polyethylene and polypropylene; polyurethanes obtained by reacting an isocyanate such as toluene di-isocyanate with a hydroxyl-containing compound such as an alkyd resin or a glycol; polyamides such as alcohol-soluble nylon, as well as many others, may be used.

No particular criticality exists in the selection of the pore-forming material but soft vinyl chloride-vinyl acetate copolymers such as Vinylite VYHH are particularly well suited because of their softness, flex strength and adherence for the underlying textile fabric ribbon.

The pore-forming layer may be applied to the pre-inked ribbon in any desired manner.

In the preferred embodiment, the resinous pore-forming material together with the non-volatile, non-solvent component and pigment or dye are dissolved in a suitable solvent such as a 3:1 mixture of ethyl acetate and toluol and the mixture ground to a suitable coating viscosity. The mixture is then spread evenly over one or both surfaces of the pre-inked textile fabric ribbon by suitable coating apparatus or by immersing the ribbon in a vat containing the mixture, and allowed to cool and harden by evaporation of the volatile ingredients to form a smooth, pressure-transferable ink-releasing ribbon of the type disclosed. It has been found advantageous to heat the final ribbon for a short time to a temperature of 160° C. or above to fuse the supercoating to the fabric ribbon.

In the selection of a material suitable as the non-volatile component, two critical requirements must be observed. Such material must be a non-solvent for the resinous pore-forming material and also be compatible with the ink carrier or vehicle of the fabric ribbon. In general, non-volatile mineral, vegetable and animal oils are found most satisfactory, such as naphthenic mineral oil, neats-foot oil, rapeseed oil, cottonseed oil, peanut oil, castor oil, olive oil, sperm oil, etc. Materials such as butyl stearate, lanolin, petrolatum and hydrogenated vegetable oil have been used successfully, particularly in admixture with the above-named oils. Fatty acids and esters may also be used, such as oleic acid, isopropyl palmitate, diglycol laurate and diglycol oleate.

In another embodiment of the present invention, the resinous pore-forming material may be compounded and applied using little or no volatile components. For instance, the resinous material such as Vinylite VYHH or VYNC may be suspended as a finely divided dispersion in either an organic liquid vehicle containing minor amounts of a volatile dispersing liquid, in which case the dispersion is called an "organosol," or in a completely non-volatile dispersing liquid in which case the dispersion is called a "plastisol." Such dispersions may be compounded in any conventional manner and are de-

scribed by Schildknecht in "Vinyl and Related Polymers" (1952) at page 434 and following. Such dispersions contain a plasticizer such as di-(2-ethylhexyl) phthalate, dioctyl sebacate and dibutoxyethyl phthalate which act as dispersing agents at room temperatures and keep the resin at a coatable consistency and which act as solvents at elevated temperatures over about 150° C. to provide a homogeneous film upon fusion at this temperature.

It has been found that when any of the non-volatile, non-solvent components referred to above, such as the mineral, vegetable and animal oils, are incorporated into such organosols or plastisols, together with coloring matter if desired, and applied to one or more surfaces of the pre-inked textile fabric ribbon and fused at elevated temperatures, there results, on cooling, the formation of a porous, spongy, ink-releasing element of the same type prepared using volatile solvents. This is important in cases where it is desired to avoid the hazards of using such volatile solvents.

The ribbons prepared in this manner have an exceptionally long life due in part to the fact that the supercoating serves to meter or regulate the quantity of ink solution which is transferred to an underlying sheet under the impact of the type bar. This prevents the transfer of too much ink and provides for uniform ink transfer and thus uniformly toned copies.

Where it is desired to produce a type writer ribbon having only its imaging surface supercoated as shown by FIG. 1, this is accomplished preferably by applying a coating of the resinous pore-forming composition to a wide web of the inked textile fabric, allowing the composition to set, and then cutting the coated web into a plurality of strips or ribbons in known manner.

Where it is desired to produce a ribbon in accordance with FIG. 2 of the drawing, this is accomplished preferably in the same manner as above, except that prior to cutting the web into individual ribbons, the supercoated web is coated on its opposite side with an ink-impervious, continuous layer of plastic film or resin composition. This is done, for instance, by applying a thin film of synthetic resin comprising any of the synthetic resin materials employed in the porous protective layer, dissolved in a volatile solvent therefor, to the unprotected side of the fabric ribbon and allowing the solvent to evaporate. No non-volatile material is used in this coating and so the resin composition sets to a continuous, ink-impervious layer 30. If desired, layer 30 may be applied prior to layer 10, or both layers may be applied simultaneously. Another method of applying layer 30 is to use a self-sustaining film of material such as Mylar, Saran or the Vinylites such as VYHH and adhere it to the fabric ribbon through the use of adhesives.

When it is desired to prepare a ribbon which is supercoated on both sides as shown by FIG. 3 of the drawing, the wide web of textile fabric is coated, preferably simultaneously, on both sides with the resinous pore-forming composition. In this manner it has been found that the ribbon does not require the extra step of sealing the loose edges since the supercoating accomplishes this result by adhering to any loose threads or filaments and binding them to the ribbon body.

It should be understood that many variations may be made within the scope of the present invention. For instance, the ribbons shown by FIGS. 1 and 2 of the drawing may be inked with resinous pore-forming ink composition rather than conventional ribbon ink. Likewise, in any of the supercoatings 10, the pores 11 may or may not be supplied with pigment or dye depending upon whether a ribbon of exceptionally long life or a ribbon of exceptional cleanliness is desired. Also the ribbon shown by FIG. 3, for instance, may carry pigment in the supercoating on the imaging surface of the ribbon and no pigment in the supercoating facing the type bars.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

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We claim:

1. A pressure-sensitive transfer element comprising a flexible foundation bearing an ink-releasing composition containing imaging material and a non-volatile vehicle, and having on the surface of said composition a porous, spongy, ink-transmitting supercoating comprising a vinyl resin and a non-volatile oily material which is a non-solvent for said resin, said non-volatile vehicle being miscible with said oily material and also being a non-solvent for said resin.

2. A typewriter ribbon according to claim 1 in which the flexible foundation comprises a fabric and the ink-transmitting supercoating is present on the front surface of the fabric and the back surface has attached thereto a continuous, ink-impervious resinous coating.

3. A typewriter ribbon according to claim 1 in which the supercoating also contains imaging material.

4. A typewriter ribbon according to claim 1 in which the vehicle of the ink-releasing composition and the oily material of the supercoating each comprises mineral oil.

5. A pressure-sensitive transfer element according to claim 1 in which the ink-releasing composition comprises a porous, spongy, resinous composition comprising a vinyl resin, a non-volatile oily vehicle which is a non-solvent for said vinyl resin and a quantity of imaging material.

6. The process of producing pressure-sensitive transfer elements which are clean to the touch and which have a relatively long life which comprises coating a flexible foundation with an ink-releasing composition containing imaging material and a non-volatile vehicle, and applying

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to the surface of said coating an ink-transmitting supercoating of resinous composition comprising a vinyl resin and a non-volatile oily material which is a non-solvent for said resin, said non-volatile vehicle of the ink composition being miscible with the non-volatile oil material of the supercoating and also being a non-solvent for said resin, and allowing said supercoating to set whereby is formed as the continuous phase a porous, substantially non-pressure-transferable layer of said resin containing as the discontinuous phase said non-volatile oily material.

7. The process of claim 6 in which the vehicle of the ink composition and the oily material of the supercoating each comprises mineral oil.

8. The process of claim 6 in which the ink-releasing composition comprises a vinyl resin, a non-volatile oily vehicle which is a non-solvent for said vinyl resin and a quantity of imaging material.

9. The process of claim 6 in which the flexible foundation comprises a fabric and the supercoating is applied to the front surface of the fabric and the back surface of the fabric has attached thereto a protective, continuous, ink non-transmitting layer.

10. The process of claim 6 in which the supercoating also contains imaging material.

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