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(54) **A ribbon for non-impact electrothermic printing.**

(57) A ribbon for non-impact electrothermic printing is provided. The ribbon includes an electrically conductive substrate and a transfer layer. The transfer layer comprises colouring material and glycerol ester of hydrogenated rosin. The transfer layer also included ethyl cellulose.

A RIBBON FOR NON-IMPACT ELECTROTHERMIC PRINTING

The invention relates to a ribbon for non-impact, electrothermic printing.

U.S. patents 2,713,822 and 3,744,611 are illustrative of the prior art of non-impact, electrothermic printing employing a ribbon containing a transfer coating and a substrate. Electrothermic printing ribbons are known in the art and are disclosed, for example, in U.S. patents 3,744,611 and 3,988,131. U.S. patent 3,988,131 discloses transfer layers formed from styrene resins and/or terpene resins and epoxy resins. It also mentions ketonic resins, ethers of colophony and non-drying alkyd resins. (It should be noted that colophony is another name for rosin.) Polyamides, phenol-formaldehyde resins, and ethylene-vinyl acetate copolymers have also been found useful in transfer layers.

According to the invention there is provided a ribbon for non-impact printing characterised in that the ribbon includes an electrically conductive substrate and a transfer layer comprising colouring material and glycerol ester of hydrogenated rosin.

It has now been found that superior electrothermic printing can be obtained by using a ribbon comprising an electrically conductive substrate and a transfer layer which comprises colouring material and glycerol ester of hydrogenated rosin. The presence of glycerol ester of hydrogenated rosin makes the resulting printing capable of finer resolution than previously obtained, and also has the additional advantage of being more readily correctable. Furthermore, the glycerol ester of hydrogenated rosin has less tendency to adhere to the electrically conductive substrate and, therefore, transfers easier than previously known transfer layers.

When glycerol ester of hydrogenated rosin is used in the transfer layer, the resulting printing sticks to the paper so that it does not smear. The printing, however, may be removed by lift-off or abrasion, i.e. rubbing, methods more readily than previously obtained printing. This totally unexpected advantage makes correction of the printed product much easier than was previously the case.

As is well known in the art, a ribbon for thermoelectric transfer printing comprises an electrically conductive substrate. This conveniently may be a layer of polycarbonate which has been made electrically conductive by the inclusion of small particles of carbon. This polycarbonate-carbon may, when desired, be coated with a layer of aluminium which is from about 1,000 to about 1,500 Å units thick. The transfer layer is placed on top of this conductive substrate. The transfer layer comprises one or more coloured materials. The colouring materials most often employed are carbon black and various dyes, which may be used alone or in combination with each other. In general, it is desirable that the ratio by weight of coloured material to glycerol ester of hydrogenated rosin be from approximately 2% to approximately 50%, preferably about 10%.

The transfer layer is most conveniently applied to the conductive substrate from solution, for example, by means of a meniscus coater. It has been found that the coating properties of glycerol ester of hydrogenated rosin are improved when there is added to the coating mixture some ethyl cellulose. Ethyl cellulose is usually added in an amount from about 5% to about 10% by weight of glycerol ester of hydrogenated rosin.

EXAMPLE 1

A substrate was prepared of 70% by weight of polycarbonate resin and 30% conductive carbon dispersed therein. This layer was metallized

with approximately 1200 A° units of aluminium. A solution was prepared of 20 grams of STAYBELITE ester 5, 1.8 grams carbon black and 0.1 grams of methyl violet in 80 grams of isopropyl alcohol. (STAYBELITE ester 5, is the trademark of Hercules, Inc. for their brand of glycerol ester of partially hydrogenated wood rosin). It is a pale, medium-hard, thermoplastic resin with resistance to oxidation and discolouration. It has a low odour and a low acid number.) The above solution, with the carbon in suspension, was applied to the aluminized layer by means of a meniscus coater. The ink layer, after drying, was determined to be 12 microns thick. The resistive ribbon was used in writing in an electrothermic printing apparatus. At a current level of 55-60 milliamps, excellent quality images were obtained; density and image sharpness were a very high order. Furthermore, even though the resulting printing was smear free, it was possible to remove it by lift-off and by abrasion methods.

EXAMPLE 2

Another resistive ribbon film was prepared by coating an ink transfer layer of the following formulation on a metallized polycarbonate-carbon resistive layer:

- 1.60 grams Regal 330 carbon (Cabot Corp)
- 1.15 grams ethyl cellulose (20Cps)
- 0.09 grams methyl violet
- 40.0 grams isopropyl alcohol.

The above was placed in an 8 oz. bottle with 200 grams of steel balls and was mixed on a paint shaker for 45 minutes.

The mixture was allowed to cool and 17.25 grams of Staybelite ester 5 with 40 grams of isopropyl alcohol was added. The mixture was again placed on a paint shaker for an additional 45 minutes.

After cooling, the mixture was applied on a metallized resistive layer by means of a meniscus coater so that the final dry thickness was approximately 2-4 microns thick.

The resultant resistive ribbon was used to print high quality images with good release properties, i.e., the ribbon did not stick to the paper upon transfer of the ink.

The ink must be easily released from the ribbon to the paper during the printing step or the ink will act as a "glue" between the paper and ribbon, preventing separation of the ribbon from the paper. The ink layer with Staybelite ester 5 as a thermoplastic resin is easily released from the metallized resistive layer. The images were of good resolution.

EXAMPLE 3

In another example, a ribbon was made as in Example 2, except 0.86 grams ethyl cellulose was used instead of 1.15 grams. The print was formed at 480 x 480 PEL (Picture Elements). In both cases the images were non-smear with print densities of about 1.0 optical density when printed with a voltage of about 12 volts and a current of about 50 milliamps.

CLAIMS

1. A ribbon for non-impact printing characterised in that the ribbon includes an electrically conductive substrate and a transfer layer comprising colouring material and glycerol ester of hydrogenated rosin.

2. A ribbon as claimed in Claim 1, in which the transfer layer also comprises ethyl cellulose.

3. A ribbon as claimed in Claim 2, in which the glycerol ester of hydrogenated rosin and the ethyl cellulose are present in a weight ratio of from about 5% to about 10%.

4. A ribbon as claimed in any one of Claims 1 to 3, in which the transfer layer is about 3 mils thick.

5. A ribbon as claimed in any one of the preceding Claims, in which the colouring material to glycerol ester of hydrogenated rosin ester weight ratio is from about 2% to about 50%.