United States Patent [19]

Bossard et al.

[11] **3,915,628**

[45] **Oct. 28, 1975**

[54] **CONTINUOUS DRY TRANSFER-PRINTING PROCESS ON TEXTILE WEBS MADE FROM ORGANIC MATERIAL, AND APPARATUS FOR THE CARRYING OUT OF THE PROCESS**

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[73] Assignee: **Ciba-Geigy AG,** Basel, Switzerland

[22] Filed: **Dec. 20, 1972**

[21] Appl. No.: **316,806**

[52] **U.S. Cl.** ..... **8/2.5;** 101/425; 68/5 D; 8/39; 8/41 R

[51] **Int. Cl.**[2] **D06P 1/00**

[58] **Field of Search** ..... 8/2.5, 39, 41 R; 101/425

[56] **References Cited**

UNITED STATES PATENTS

2,393,992	2/1946	Kauffeld	101/425
2,404,350	7/1946	Carlsen et al.	101/425
2,832,290	4/1958	Mitchell et al.	101/425
3,280,735	10/1966	Clark et al.	8/2.5 X

FOREIGN PATENTS OR APPLICATIONS

647,105	12/1950	United Kingdom	8/2.5
951,987	3/1964	United Kingdom	8/2.5

OTHER PUBLICATIONS

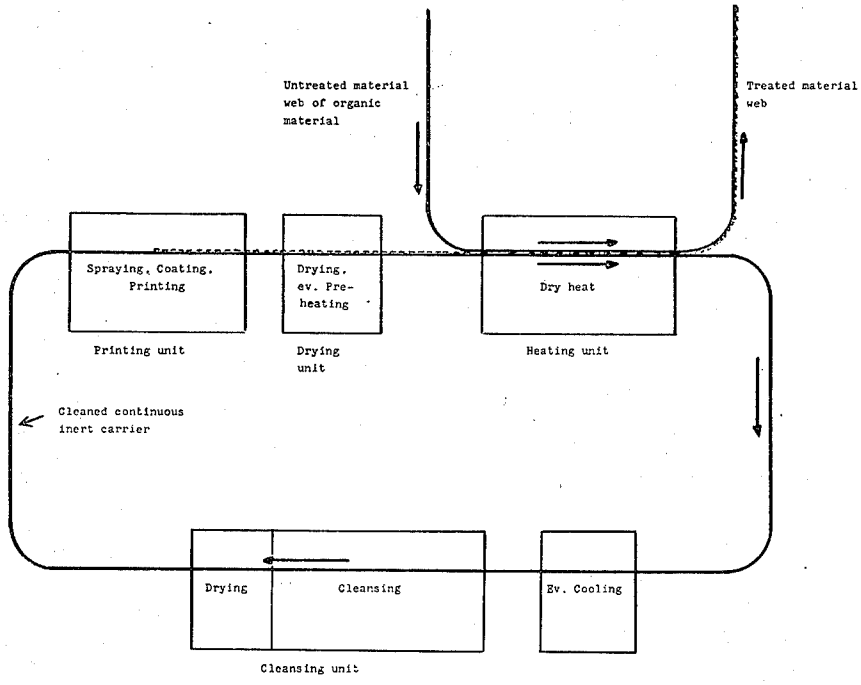
Fox et al., J. Soc. Dyers & Colorists, Dec. 1969, pp. 614–616.

Primary Examiner—Donald Levy
Attorney, Agent, or Firm—Wenderoth, Lind & Ponack

[57] **ABSTRACT**

An improved continuous dry transfer-printing process on textile webs made from organic material, particularly textile webs made from synthetic organic fibers, and an apparatus for the carrying out of the process are described, which comprises passing a continuous inert carrier successively through a printing unit comprising the application to said carrier, once or repeatedly, of preparations containing at least one compound converting at atmospheric pressure above 130°C into the vapour phase, optionally a bonding agent stable below 250°C, and water and/or an organic solvent; a drying unit comprising the drying of the said preparation; the subsequent bringing into contact of the treated side of the continuous inert carrier with the side to be printed of the material web of organic material in such a manner that carrier and web move along synchronously one against the other; a heating unit comprising the subjecting thereupon of carrier and material web, optionally under mechanical pressure, to a heat treatment at a temperature of at least 130°C until the penetration of the said compound(s) into the material web has occurred, the subsequent removal of the printed material web from the continuous inert carrier; a cleansing unit comprising the cleansing afterwards of the continuous inert carrier, and repetition of the cycle of the operations.

9 Claims, 2 Drawing Figures



Figur 1

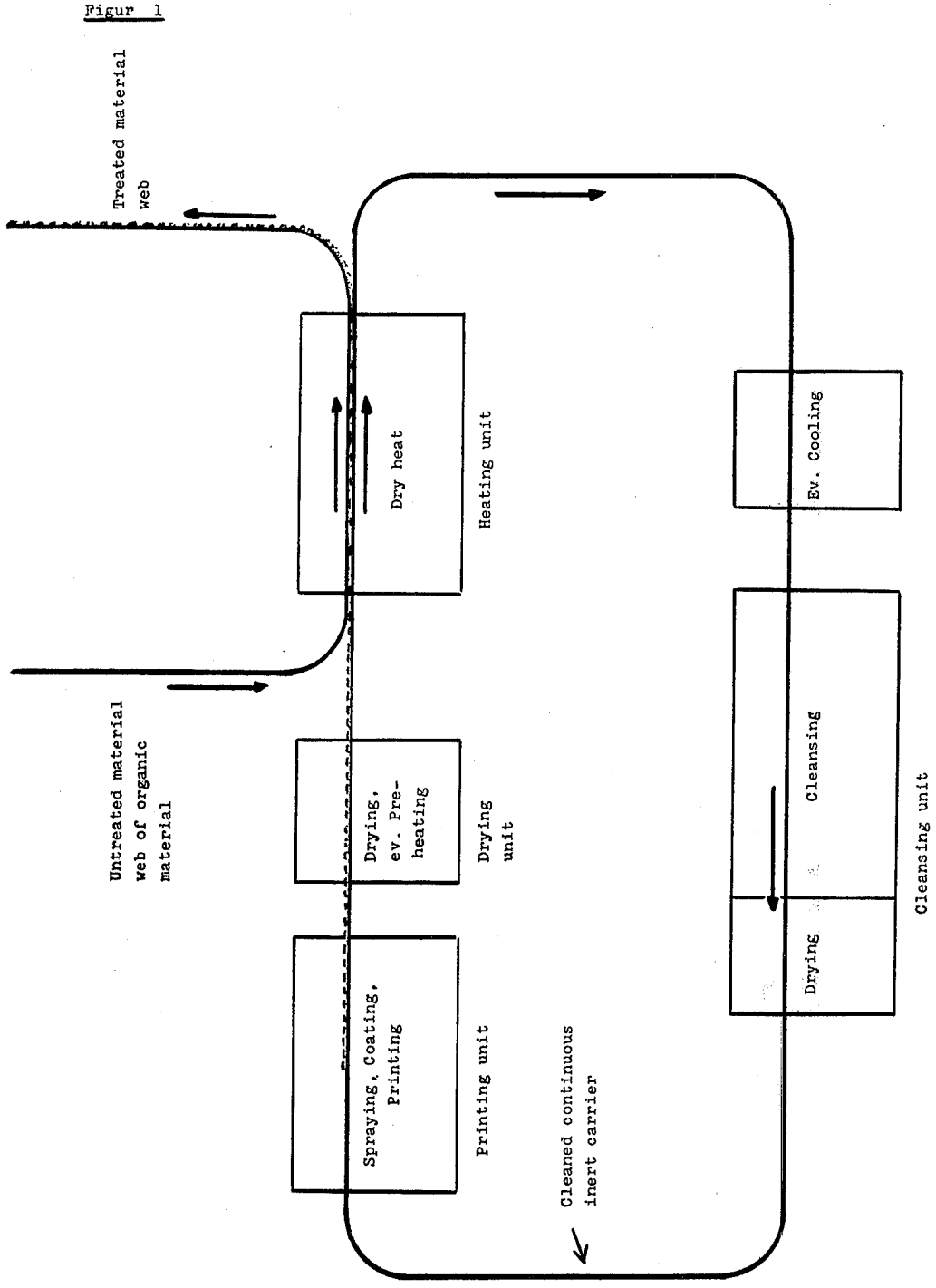
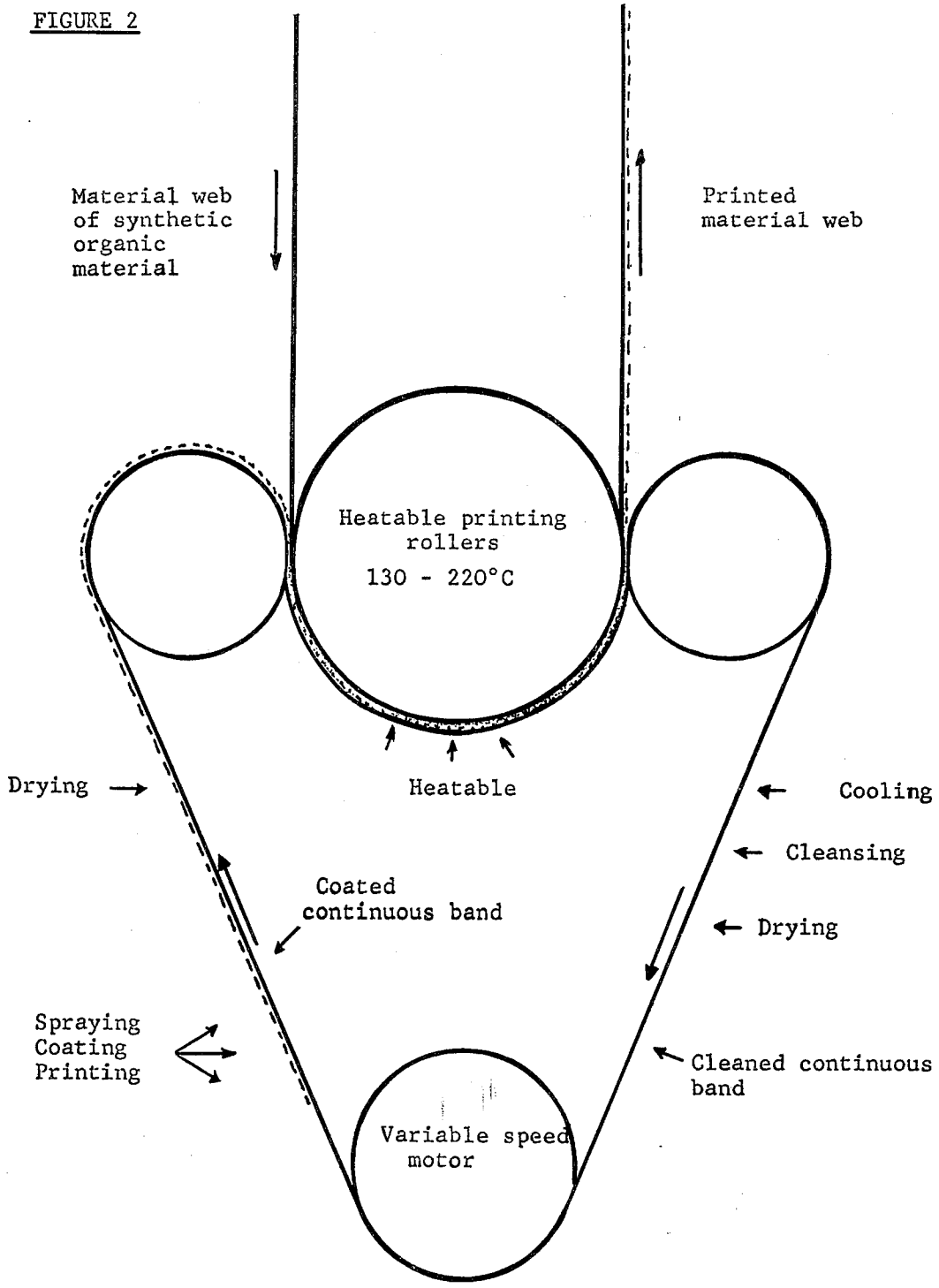

Treated material web
Untreated material web of organic material
Dry heat
Heating unit
Drying, ev. Pre-heating
Drying unit
Spraying, Coating, Printing
Printing unit
Cleaned continuous inert carrier
Ev. Cooling
Cleansing
Drying
Cleansing unit

FIGURE 2


Material web of synthetic organic material
Printed material web
Heatable printing rollers
130 - 220°C
Heatable
Drying
Cooling
Cleansing
Drying
Coated continuous band
Spraying
Coating
Printing
Cleaned continuous band
Variable speed motor

CONTINUOUS DRY TRANSFER-PRINTING PROCESS ON TEXTILE WEBS MADE FROM ORGANIC MATERIAL, AND APPARATUS FOR THE CARRYING OUT OF THE PROCESS

The present invention relates to a continuous dry transfer-printing process on material webs made from organic material, particularly on textile webs made from synthetic organic fibres, by use of compounds applied to a continuous inert carrier, the said compounds converting, at atmospheric pressure, at temperatures above 130°C into the vapour phase; to apparatus for the carrying out of the said process; as well as to the organic material, as an industrial product, printed by the new process.

Transfer-printing processes are known which consist in the dry printing of synthetic fibres by application of dispersion dyestuffs which convert into the vapour phase at atmospheric pressure at temperatures of between 150 and 220°C. The application and fixing of the dyestuffs are effected by the bringing together of the synthetic fibres to be printed and the carrier printed beforehand with the said dispersion dyestuffs, and the subsequent action of heat applied to the point of contact between carrier and synthetic fibres. Such processes are described, for example, in the French Pat. Nos. 1,223,330 and 1,334,829.

Carriers employed in these processes are, e.g. aluminium foil or sheets and, on account of the low production cost, specially paper sheets. These known processes have the disadvantage that storage both of the unprinted and of the treated carriers of medium-large to large dimensions requires special accomodation space, and that the paper accumulating after completion of transfer-printing operations has to be burnt or returned to the paper industry for re-utilisation. Moreover, the user of the printed carriers is dependent on the supplier; he cannot himself undertake the designing of the printing in the desired shades. Finally, delivery of specific designs or of new designs inevitably means delays to a greater or lesser extent.

A process has now been found which renders possible the dry printing of webs of organic material, the said printing being effected in a simple manner, and with avoidance of the difficulties and disadvantages referred to above. The new continuous dry transfer-printing process on material webs made from organic material, particularly on textile webs made from synthetic organic fibres, comprises:

a. the application to a continuous inert carrier, i.e. a carrier having no affinity to the transfer-printing compounds, once or repeatedly, of preparations containing at least one compound converting at atmospheric pressure above 130°C, preferably above 160°C, into the vapour phase, optionally a bonding agent stable below 250°C, and water and/or an organic solvent, and the drying of the said applied preparations;

b. the subsequent bringing into contact of the treated side of the continuous inert carrier with the side to be printed of the material web of organic material in such a manner that carrier and web move along synchronously one against the other;

c. the subjecting thereupon of carrier and material web, optionally under mechanical pressure, to a heat treatment at a temperature of at least 130°C until the penetration of the said compound(s) into the material web to be printed has occurred;

d. the subsequent removal of the printed web from the continuous inert carrier;

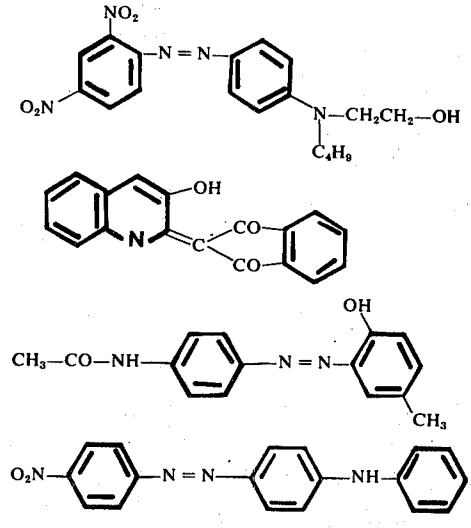
e. the cleansing afterwards of the continuous inert carrier; and

f. the repetition of the cycle of operations (a) to (e).

The continuous endless inert carrier applicable according to the invention is advantageously a geometrically stable, flexible, and continuous band having advantageously a smooth surface; the said band is washable, stable at elevated temperature, resistant to mechanical stresss, and can consist of the most diverse materials, e.g. metal such as aluminium or steel, plastics, water- and optionally solvent-resistant paper or textile fabrics, which are optionally coated with a film of vinyl resin, ethylcellulose, polyurethane resin or Teflon. It is advantageous to use flexible continuous bands made of stainless steel, aluminium or paper.

The following may be mentioned as examples of a compound converting at atmospheric pressure above 130°C into the vapour phase: sublimable dispersion dyestuffs, optical brighteners, textile protective agents, especially biologically active protective substances, which impart to the textile material, e.g. bacteriostatic and/or fungistatic and/or fungicidal properties, and finishing agents, which produce on the textile material the desired effects, e.g. antistatic, oil- and water-repellent properties, handle-enhancing or fireproof properties. If the mentioned textile protective agents and/or finishing agents are to be applied along with the defined dispersion dyestuffs and optical brighteners to the material to be printed, then the said auxiliary agents can be applied at the same time as the dyeing is performed; it is, however, more advantageous to apply them in a subsequent operation.

The sublimable dispersion dyestuffs usuable according to the invention can belong to the most diverse classes of dyestuffs. These are, in particular, monoazo, quinophthalone, methine and anthraquinone dyestuffs, as well as nitro, styryl, azostyryl, naphthoperinone- or naphthoquinoneimine dyestuffs. These dyestuffs made up as commercial products generally contain dispersing agents, i.e. agents possessing surface-active properties, which render possible or facilitate the dispersion of these dyestuffs in water. The content of dispersing agents is not necessary with the use of anhydrous printing pastes. Examples of sublimable dispersion dyestuffs usuable according to the invention are as follows:



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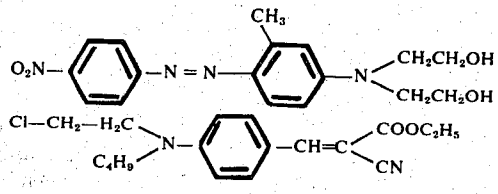
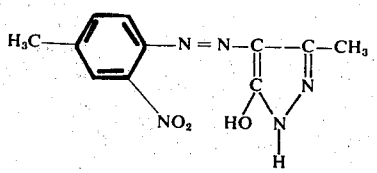
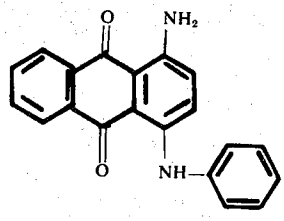
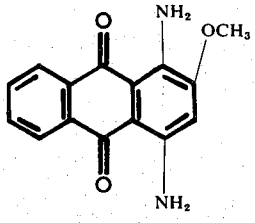
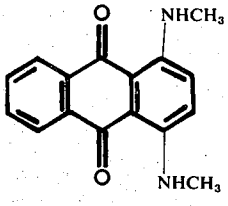
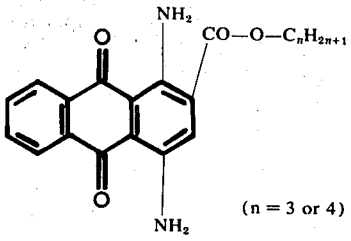


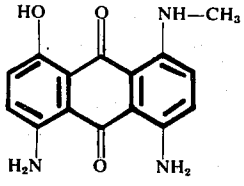


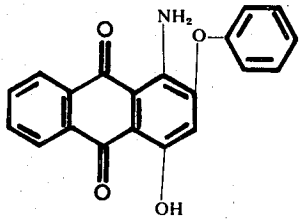


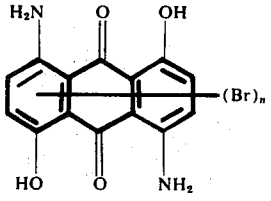




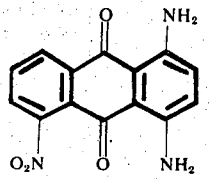

(n = 3 or 4)

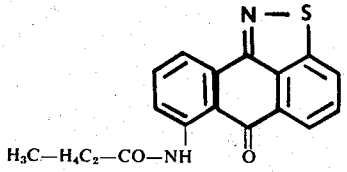


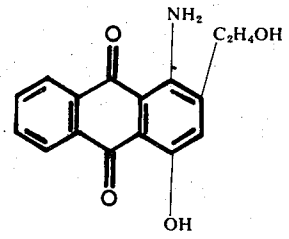


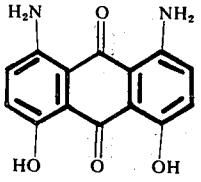

(n = 1 or 2)

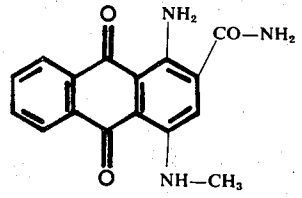
4

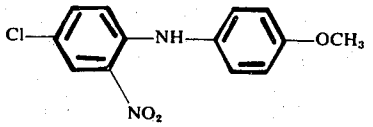


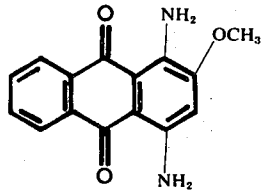


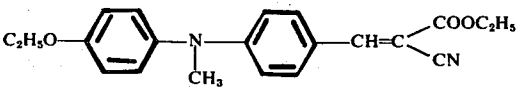


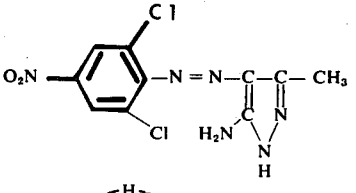


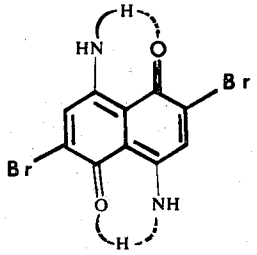












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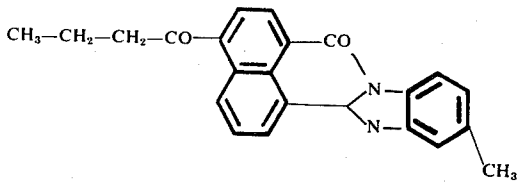

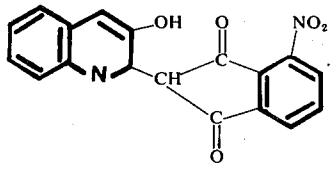

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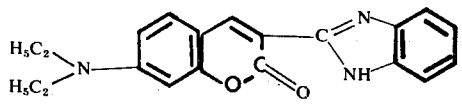
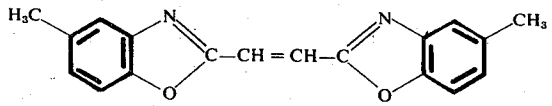
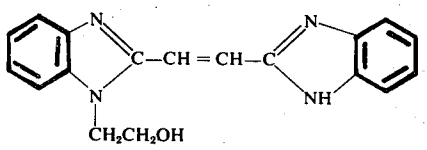
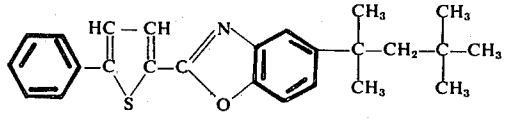
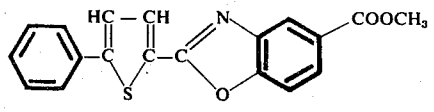


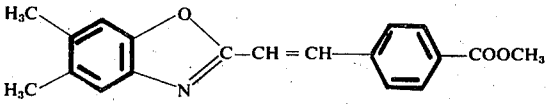
The sublimable optical brighteners can belong to any desired class of optical brighteners. These are, in particular, coumarins, benzocoumarins, pyrazines, pyrazolines, oxazines, oxazolyl, thiazolyl, dibenzoxazolyl or dibenzimidazolyl compounds, as well as naphthalic acid imides. The following are examples of sublimable optical brighteners usable according to the invention:

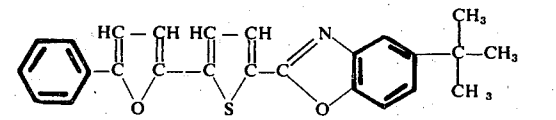


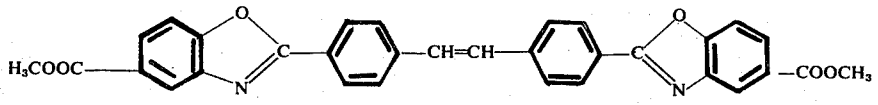


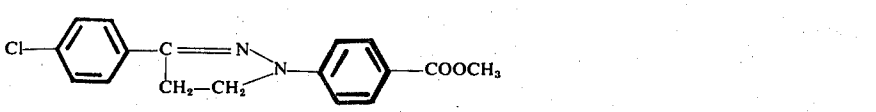


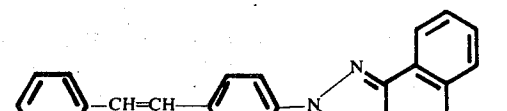


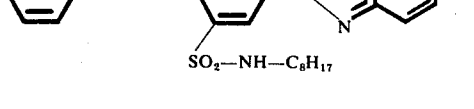


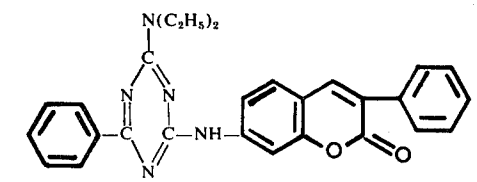












shade of colour or brightening effect or finishing properties, and, on the other hand, the temperature at which these compounds convert without decomposition into the vapour state. Preferred compounds are compounds of which the transfer temperature is between 175° and 220°C. For the obtainment of a multicoloured design, it is preferable to employ sublimable dyestuffs having transfer temperatures of the maximum possible similarity, i.e. dyestuffs which have similar transfer temperatures, not differing by more than 20°C, between 180° and 220°C.

Bonding agents stable below 250°C, i.e. those which do not melt at the transfer temperature, are obtainable commercially, and are used on a large scale for the printing of textile materials. The bonding agents have merely to retain the compounds, which convert into the vapour phase, on the printed area of the continuous band, without modifying the said compounds. Such bonding agents are preferred, for example, that dry quickly in a warm air stream, and form on the continuous carrier a fine, preferably non-adhering film. Suitable water-soluble bonding agents are: alginate, tragacanth, carubin (from locust bean flour), dextrin, to a lesser or greater degree etherified or esterified mucilage, carboxymethylcellulose or polyacryloamide; and suitable bonding agents soluble in organic solvents are: cellulose esters such as nitrocellulose or cellulose acetate, and particularly cellulose ethers such as methyl-, ethyl-, propyl-, isopropyl-, benzyl- or hydroxyethylcellulose, as well as mixtures thereof.

Suitable organic solvents are water-miscible and non-water-miscible organic solvents, or solvent mixtures, having a boiling point at normal pressure of below 120°C, preferably of below 105°. Preferred organic solvents are aliphatic or aromatic hydrocarbons such as toluene, cyclohexane, petroleum ether; lower alkanols such as methanol, ethanol, propanol, isopropanol; esters of aliphatic monocarboxylic acids such as acetic acid-ethyl or -propionic ester, and ketones such as methyl ethyl ketone, and halogenated hydrocarbons, such as perchloroethylene, trichloroethylene, 1,1,1-trichloroethane or 1,1,2-trichloro-2,2,1-trifluoroethylene. Mixtures too of these solvents can be advantageously used, e.g. a mixture of methyl ethyl ketone and ethanol in the ratio of 1:1. The desired viscosity of the printing pastes can then be obtained by addition of the said bonding agents, or by dilution with water or with a suitable solvent.

Organic material which can be treated according to the invention, are natural and in particular synthetic fibres. Natural fibres which may be mentioned are: cellulose, wool or silk and suitable synthetic fibres: cellulose esters such as cellulose-2½- and especially cellulose tiracetate, polyamides such as polyhexamethylenediamineadipate, poly-ε-caprolactam or poly-ω-aminoundecanoic acid, polyurethanes, polyesters such as polyethylene glycol terephthalate or polycyclohexanedimethyleneterephthalate, polyacrylonitrile, modified synthetic polyesters or polyamides, polyolefins such as polypropylene, polyvinyl alcohol, polyvinyl chloride; and regenerated cellulose such as viscose, or also mixtures of these materials, e.g. mixtures of polyacrylonitrile/ polyester, polyamide/polyester, and polyester/cotton and polyester/wool, as well as leather and artificial leather.

The material webs of natural and synthetic fibres can be in the most diverse stages of processing, e.g. they can be in the form of films, sheets, bands, belts, textile fabrics, looped fabrics, non-woven goods, or textile floor coverings such as woven needle-felt carpets, or yarn assemblies.

The preparations usable according to the invention are produced by a process in which the compound(s) converting at atmospheric pressure above 130°C into the vapour phase is or are dissolved or finely dispersed in water and/or solvent or solvent mixture, advantageously in the presence of a bonding agent stable below 250°C.

These preparations are continuously applied to the moving continuous carrier, in places or over the whole surface, e.g. spraying, coating or advantageously by printing. The most diversified methods may be employed for printing, such as relief printing (e.g. letterpress), gravure printing (e.g. roller printing), screen printing (e.g. rotary printing, silk-screen printing) or electrostatic printing.

It is possible to apply to the continuous carrier, by means of one of the said printing methods, one dyestuff or optionally, a multicoloured design; or to print the continuous band successively in a ground shade and then with identical or different designs.

The preparations are dried after application to the continuous carrier, the drying being performed, e.g. with the aid of a warm air-stream, or by means of infrared irradiation, optionally with recovery of the employed solvent.

The pretreated side of the moving continuous carrier is thereupon brought into contact with the side to be printed of the likewise moving material web of organic material, the contact being effected in such a manner that carrier and material web move along synchronously one against the other, and undergo together a heat treatment of at least 130°C.

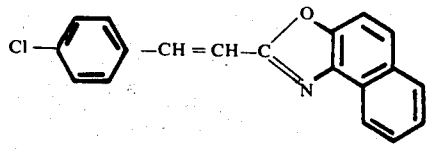
The action of heat can be applied in various known ways, e.g. by the passing of the material through a tunnel shaped zone heated, e.g. with hot air, or over a heating drum or heating plate, advantageously in the presence of a pressure-exerting, unheated or heated backing-roll, or of a heated calender, optionally under vacuum, the devices being heated by steam, oil, infrared-irradiation or microwaves to the required temperature, or located in a preheated heating chamber.

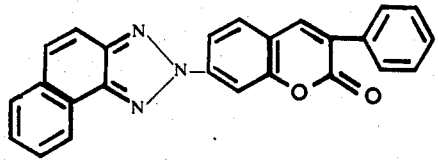
Depending on the temperature at which the compounds convert into the vapour phase, temperatures of above 130°C are necessary, the temperatures for sublimable dispersion dyestuffs and for optical brighteners being above 160°C, and advantageously between 175 and 220°C. These temperatures are maintained, preferably for 10 to 120 seconds, until the penetration of the compound(s) into the material web to be printed has occurred.

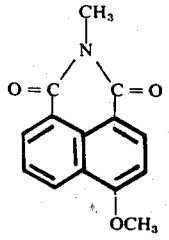
If textile protective agents and/or finishing agents are applied to the textile material in a second operation following the dyeing of the said material, then the contact and heating times as well as the temperatures are essentially the same as in the case of the dry printing process with dyestuffs or optical brighteners.

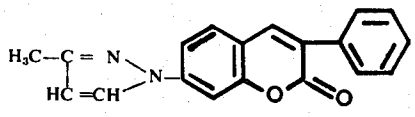
The printed material is removed from the continuous carrier after completion of the heat treatment.

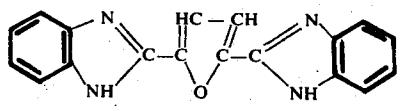
The printed material requires no aftertreatment: neither a steam treatment to fix the dyestuff or the finishing agent, nor a washing treatment to improve the fastness to wet processing.

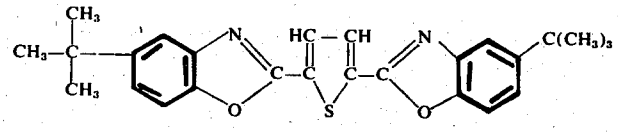


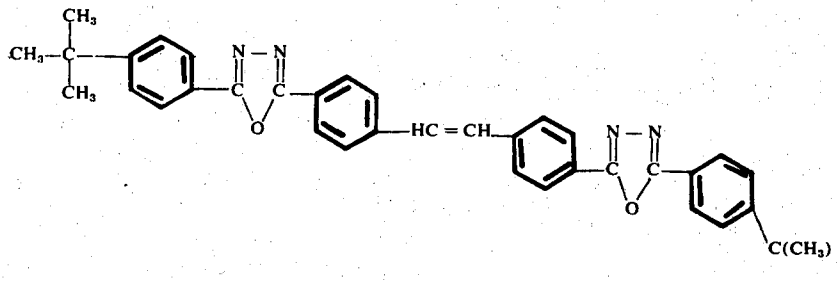






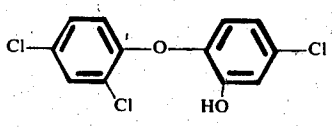




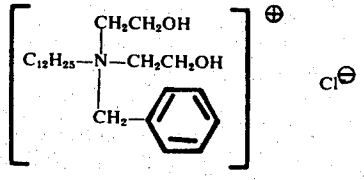


The textile protective agents and finishing agents usable according to the invention are in most cases known, or can be produced by processes known per se. They belong to the most diverse classes.

The compound of the formula

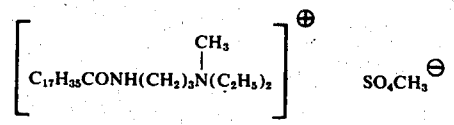


may be given as an example of a sublimable bacteriostatic protective substance; and the compound of the formula



as an example of a sublimable fungistatic protective substance.

The compound of the formula



as example of a sublimable compound imparting to the textile fabric antistatic properties; and paraffin as an example of a compound imparting to the textile fabric water-repellent properties.

Factors to be taken into account in selecting the sublimable dispersion dyestuff(s) or optical brightener(s) or finishing agent(s) are, on the one hand, the desired

The continuous carrier is thereupon cleansed of residues. This is done mechanically, e.g. by means of a rotating brush or a wiper, or by rinsing with water and/or organic solvents, advantageously, however, by means of spraying under pressure, or by a combination of the said measures.

Compared with known processes, the process according to the invention has appreciable advantages. The main advantages are as follows: the printing of the continuous inert carrier and the transfer of the compound converting into the vapour phase can be performed in one and the same operation; there is no accumulation of waste paper to be disposed of or reprocessed; since the same carrier is always employed, no storage space is needed; furthermore, the printer is himself able to change the designs, at short notice if necessary. The process according to the invention thus constitutes, in comparison with known processes, a considerable rationalisation of the operational processes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows schematically an apparatus operating according to the present invention and

FIG. 2 shows a specific arrangement, whereby a continuous inert carrier passes successively through a spraying or printing unit, a drying unit, a heating unit also forming part of the subsequent device, and a cleansing unit, as well as a device for feeding material webs made from organic material to, and bringing them into contact with, the moving continuous carrier, the feed being effected in such a manner that carrier and material web advance synchronously, one against the other, enter together the said heating unit, undergo within the heating unit a heat treatment at a temperature of at least 130°C, preferably 160°C, and then emerge from the heating unit, at which point the material web is separated from the continuous carrier. A variable speed motor drives the fabric and carrier in a continuous band.

The printing unit or aggregate consists of known machines normally employed for the printing of paper and textiles, i.e. relief printing machines, gravure printing machines or screen printing machines.

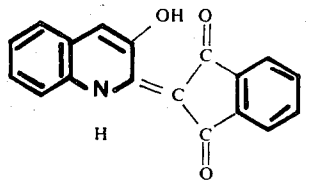
The heating unit can be a heating plate, or heating drum, or a calender, which can be heated with steam, oil, infrared irradiation, or microwaves, optionally with a vacuum connection, or these devices can be in a heating chamber or a tunnel shaped heat zone heated with hot air.

The type of cleansing unit depends on the nature of the residues; it can be a rotating brush or a wiper, or a device for rinsing with water and/or solvents, optionally in combination with a rotating brush and under pressure.

In the following examples, which do not limit the scope of the invention, the figures given for parts and percentages denote parts by weight and per cent by weight, respectively, and temperatures are expressed in degrees Centigrade. Example 1

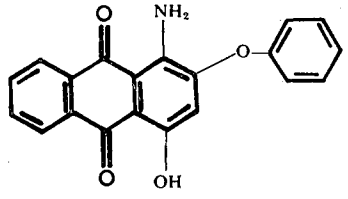
A. Preparation of printing pastes

An amount of 40 g of the yellow dispersion dyestuff of the formula

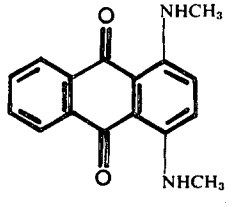


is dispersed with 100 g of ethylcellulose Type N (Hercules Co., USA) in 860 g of a solvent mixture of methyl ethyl ketone and ethanol in the volume ratio of 1:1 for 1 hour at room temperature to form a homogeneous paste.

If there is used in the above example, instead of the yellow dispersion dyestuff, 40 g of the red dispersion dyestuff of the formula



or 40 g of the blue dispersion dyestuff of the formula



with the procedure otherwise as described in Example 1, then a red and blue printing paste, respectively, are obtained.

B. Printing of the continuous carrier

The printing pastes ready to be brushed on which are described under A) are applied by means of known printing methods to the moving continuous carrier of e.g. stainless-steel sheet, and intermediately dried. Multi-coloured printings can be obtained on the continuous band by the known processes of relief printing, gravure printing, or screen printing.

C. Continuous transfer printing

After the intermediate drying of the printings, the pretreated side of the moving continuous carrier is brought into contact with the likewise moving material web of organic material in such a manner that carrier and material web move synchronously along, the one against the other, and together undergo a heat treatment. By virtue of this contact heat there occurs the transfer printing of the sublimable compounds on to the flat-shaped article, of textile or of other material, to be printed. As can be seen from the following Examples 2 to 12, the temperature and the duration of the action on the material have to be adjusted to suit the article

being printed. The printed material web is thereupon separated from the continuous carrier.

D. Cleansing of the continuous carrier

Residues of the printing pastes on the continuous carrier can be easily removed by means of rotating brushes and/or by rinsing, e.g. with a jet of water or with ethanol. After a repeated intermediate drying, the continuous carrier is ready to receive a further printing.

EXAMPLE 2

A multi-coloured design is produced on the moving continuous carrier of stainless steel sheet by use of the yellow, red and blue printing pastes mentioned in Example 1 in the photo printing process using successively interposed colour rollers; the said design is subsequently dried. In addition to yellow, red and blue, a green is also printed consisting of 80 parts of the yellow printing paste and 15 parts of the blue printing paste. Polyamide-6.6 fabric and the thus printed continuous carrier are maintained in contact for 30 seconds at 210° by means of a heated heating cylinder, the procedure being otherwise as defined in Example 1. A second roller which is not heated is used to maintain a uniform contact.

There is obtained in this manner a true reproduction of the four-colour design on the polyamide-6.6 fabric, the lines remaining sharp and distinct.

Residues are removed from the carrier by mechanical brushing and subsequent rinsing with water or with ethyl alcohol; the carrier after drying is then ready for the next coating.

EXAMPLE 3

If there is used, instead of the polyamide-6.6 fabric given in Example 2, a continuous web of a polyethylene glycol terephthalate fabric, or of a mixed fabric consisting of 33 parts of cotton and 67 parts of polyethylene glycol terephthalate, and contact maintained for 60 seconds at 210°, the procedure being otherwise as described in Example 1, then likewise is obtained a four-colour design on polyester fabric, or on a mixed fabric of polyester and cotton, possessing similar properties.

EXAMPLE 4

If there is used, instead of the polyamide-6.6 fabric given in Example 2, a continuous web of Tricel-twill fabric (a triacetate fabric), with a contact time of 60 seconds at 190°, the procedure being otherwise as described in Example 1, then there is obtained a true reproduction of the original design on the triacetate fabric, both when a plain printing with a single dyestuff and when a three- or four-colour design is used on the continuous moving carrier.

EXAMPLE 5

A multi-coloured design is produced with the yellow, red and blue printing pastes mentioned in Example 1, by the roller printing process using several colour rollers, on the continuous moving carrier of coated paper, the printed design being then dried. A sheet of cellulose-2½-acetate is placed on the thus printed continuous carrier, and carrier and material web maintained in contact by means of a calender for 60 seconds at 180°.

There is thus obtained, with the procedure otherwise as described in Example 1, a true reproduction of the multi-coloured design on the cellulose-2½-acetate sheet.

EXAMPLE 6

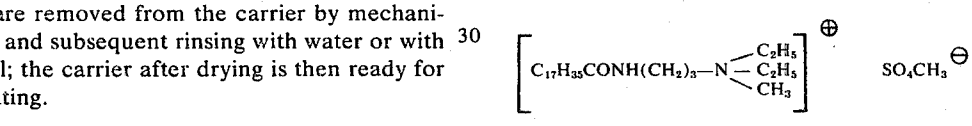
If there is used in Example 5, instead of a sheet made from cellulose-2½-acetate, a needle-felt floor-covering made of polypropylene, with contact being maintained for 120 seconds at 155°, the procedure being otherwise as described in Example 5, then likewise there is obtained a multi-coloured design on the polypropylene needle-felt floor-covering, the printed design possessing similar properties.

EXAMPLE 7

If there is used in Example 5, instead of a sheet of cellulose-2½ acetate, a continuous non-woven article made from two polyethylene glycol terephthalate non-woven qualities having a weight per square meter of 50 and 100 g, respectively, the contact being maintained for 60 seconds at 190°, with the procedure being otherwise as described in Example 5, then multi-coloured printings on said non-woven article having similar properties are obtained.

EXAMPLE 8

An amount of 100 g of the antistatic agent of the formula

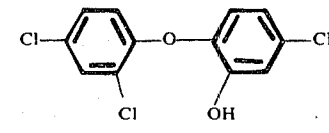


is worked up with 100 g of ethylcellulose Type N (Hercules Co. USA) in 900 g of a mixture of methyl ethyl ketone and ethyl alcohol (volume ratio 1:1) for 1 hour at a temperature of 35° to 40° to obtain a slightly viscous paste. This paste is applied by spraying, printing or coating over the whole surface of a continuous moving carrier of stainless-steel sheet, so that the amount present per square meter of band is 5 g, and subsequently dried. The thus pretreated carrier is brought together with the polyethylene glycol terephthalate fabric printed according to Example 3, and maintained in contact at 205° for 20 seconds by means of a heated cylinder. A second roller which is not heated is used to maintain a uniform contact.

There is obtained, with the procedure otherwise as described in Example 1, a multi-coloured printed polyester fabric having anti-electrostatic properties.

EXAMPLE 9

An amount of 60 g of the antimicrobic agent of the formula

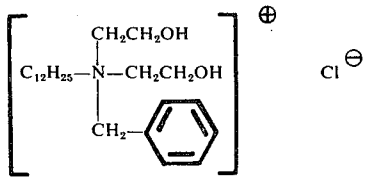


is worked up with 100 g of ethylcellulose and 940 g of methyl ethyl ketone to form a paste. This paste is applied as described in Example 8 to the continuous moving carrier. There is obtained, with the procedure otherwise as described in Example 8, a printed mul-

ticoloured polyester fabric having a finish resistant to infestation by *Staphylococcus aureus* and *Escherichia coli*.

EXAMPLE 10

An amount of 80 g of the bacteriostatic agent of the formula



is worked up as described in Example 8 with 100 g of ethylcellulose and 650 g of methyl ethyl ketone to form a paste. This paste is coated to the extent of 15 g per square meter on to the continuous moving carrier of aluminium sheet and subsequently dried. Fabric made from heavy polyamide-6.6-canvas material weighing 400 g/m² is placed on the thus treated continuous band, and carrier and material web are then maintained in contact at 195° for 40 seconds by passing through a tunnel shaped zone heated with hot air. There is obtained in this manner, with otherwise the same procedure as described in Example 1, a polyamide-6.6-canvas material having good bacteriostatic and fungistatic properties.

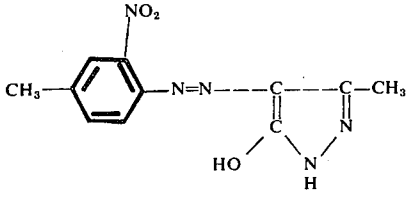
EXAMPLE 11

One part of an aqueous paraffin emulsion consisting of 15% paraffin and 15% gelatine is worked up with one part of a carboxymethylcellulose solution (1:10,000) to form a paste. This paste is applied by printing to the extent of 30 g per square meter to the whole surface of the continuous moving carrier, and then dried. A mixed fabric made from polyester and cotton (140 g/m²) printed according to Example 3 is placed on to the thus treated carrier, and carrier and material web maintained in contact at 210° for 60 seconds.

There is obtained in the manner described, with otherwise the same procedure as given in Example 1, a printed multicoloured mixed fabric of polyester and cotton which possesses excellent water-repellent properties.

EXAMPLE 12

A printing paste is prepared by the dispersion of 20 g of the yellow dyestuff of the formula (in commercial form)



and 300 g of aqueous sodium alginate thickening (5:1000) in 680 ml of water at room temperature. A moving aluminium carrier is printed with the said printing paste. After intermediate drying, the carrier is held in contact with polyester fabric for 30 seconds at 210°. There is thus obtained a fast yellow printing on polyester fabric.

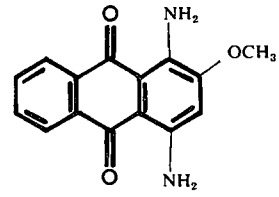
By means of an aqueous rinsing and a mechanical rubbing operation, the carrier is cleansed very easily of the residues of the printing paste, and is ready after drying for the subsequent coating.

If there is used, instead of the aqueous alginate thickening, one of the below listed thickening agents, with otherwise the same procedure as described in Example 12, then a yellow printing on polyester fabric is obtained with similarly good results.

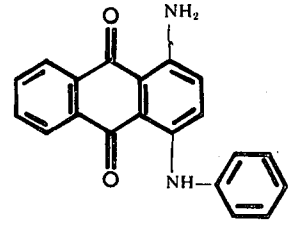
300 g/l of carboxymethylcellulose (40:1000)
30 g/l of polyacrylamide (Solidokoll K)
300 g/l of Polyprint M 138 T (60:1000) (mucin derivative)
300 g/l of Solvitose C 5 (50:1000) (starch ether).

If the polyester fabric is replaced by polyamide-6.6, polyamide-6or polyacrylonitrile fabric, with otherwise the same procedure as described in Example 12, then yellow printings having similarly good properties are obtained.

If there is used, instead of the stated dyestuff, an amount of 40 g of the finely dispersed red dyestuff of the formula



or 40 g of the finely dispersed blue dyestuff of the formula



then there is obtained on polyester fabric, in the manner described in Example 12, a brilliant pink printing or a blue printing.

We claim:

1. A continuous dry transfer-printing process which comprises successively

A. applying to one face of a continuous endless inert carrier sheet which carrier is washable, flexible and dimensionally stable under the conditions of the process, at least one preparation containing

α. at least one sublimable dispersion dyestuff converting at atmospheric pressure and above 130°C into the vapor state, and

β. a member selected from the group consisting of water, water in admixture with a bonding agent stable below 250°C, organic solvent, organic solvent in admixture with a bonding agent stable

below 250°C, mixtures of water and organic solvent, and a mixture of water, organic solvent and a bonding agent stable below 250°C,

B. effectively drying the said preparation or preparations,

C. bringing the thus treated face of the continuous inert carrier sheet into contact with one face of a textile web of organic material in a manner such that the carrier and web move along synchronously in contact,

D. heating the carrier and material web while in contact in the presence or absence of mechanical pressure at a temperature of at least 130°C until penetration of the said compound into the material web has occurred,

E. removing the thus printed material web from contact with the inert carrier,

F. cleansing the treated face of the inert carrier, and

G. repeating the cycle of steps (A) to (F).

2. A process according to claim **1** wherein the continuous inert carrier sheet is a flexible member selected from the group of stainless steel and aluminum

3. A process according to claim **1** wherein the compound or compounds employed convert to the vapor phase at a temperature between 160°C and 220°C.

4. A process according to claim **1** wherein the sublimable dispersion dyestuffs are selected from the group of monoazo, quinophthalone, methine and anthraquinone dyestuffs.

5. A process according to claim **4** wherein the transfer temperatures of the dyestuffs differ by not more than 20°C..

6. A process according to claim **1** wherein the preparation or preparations applied to the carrier face contain a bonding agent which forms a fine film on the carrier.

7. A process according to claim **1** wherein the textile web is composed of at least one synthetic organic material.

8. A process according to claim **7** wherein the synthetic organic material is selected from the group of cellulose esters, polyamides, polyesters and mixtures thereof.

9. A process according to claim **1** wherein the heating step (D) is at a temperature between 160° and **220°** C. for from 10 to 120 seconds.

* * * * *