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J. BJORKSTEN ET AL
NONSMUDGING TRANSFER SHEET

2,188,590

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Fig. 1.

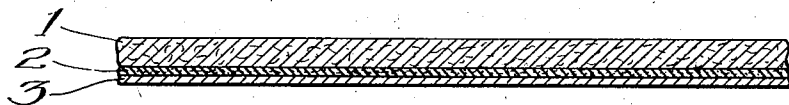


Fig. 2.

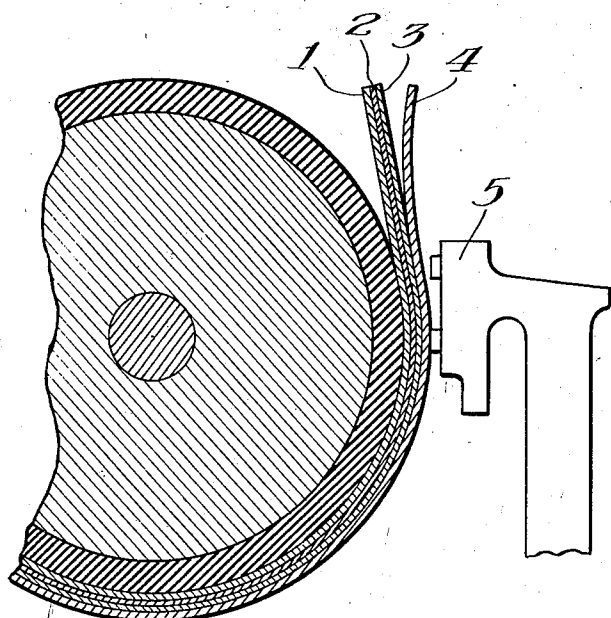
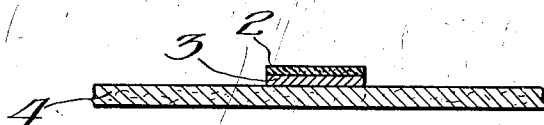


Fig. 3.



Inventors:
Johan Bjorksten,
William J. Champion
By: Zabel, Carlson, Fitzbaugh & Wells
Attorneys

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NONSMUDGING TRANSFER SHEET

Johan Bjorksten, Chicago, and William J. Champion, La Grange, Ill., assignors to Ditto, Incorporated, Chicago, Ill., a corporation of West Virginia

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9 Claims. (Cl. 282-28)

This invention relates to transfer sheets, and more particularly to nonsmudging impression type transfer sheets. It includes transfer sheets such as carbon paper, typewriter ribbon, and the like, which are coated with a composition which is transferable to a contacting surface by the application of pressure or impact such as may be produced by a pencil or the keys of a typewriter. These impression type transfer sheets may generally be divided into three classes: (1) transfer sheets such as ordinary carbon paper, which contain a pigment; (2) transfer sheets such as hectograph carbon paper which contain a soluble dye, and (3) transfer sheets such as printing process carbon paper, which contain a waxy or oily ink absorbent material.

An object of this invention is to provide a smudge proof impression type transfer sheet which is capable of forming clear and adherent impressions.

Another object is to provide a smudge-proof transfer sheet of the type which contains a soluble dye, and is suitable for spirit process or hectograph use.

A further object is to provide a smudgeproof transfer sheet of the type which contains waxy or oily ink absorbent material, and which is suitable for making impressions which may be reinked.

Other objects and features of this invention will become apparent as the following detailed description progresses, reference being had to the accompanying drawing, in which:

Fig. 1 is an enlarged sectional view of the smudge-proof transfer sheet.

Fig. 2 is a detailed sectional view showing the invention applied to typewriter operation.

Fig. 3 is an enlarged detail sectional view of an impression produced from the transfer sheet of Fig. 1 on a master sheet.

Referring to the drawing in which an embodiment of the invention is shown, reference character 1 designates a base sheet such as tissue paper or other sheet material having thereon a transfer coating 2 of a soluble dye or of an oleaginous composition depending on the application of the invention, and having a smudge proof layer 3 over said coating 2.

In the preferred embodiment of the invention the smudge proof layer 3 comprises a resin, preferably in combination with a plasticizer, and is of such friability, strength, and adhesive power that when the transfer sheet is used with a contacting sheet 4 for duplicating in the usual pressure or impact manner, as for example by means

of the keys 5 of a typewriter as shown in Fig. 2, portions of the resin and the underlying composition will be detached together from the coating to form an imprint on the contacting sheet, as shown in Fig. 3, and will be firmly secured to said sheet by means of the resin.

It has been discovered that natural and synthetic resins which are of high enough molecular weight to be frangible nonsmearing solids but of not such high molecular weight as to form tough, self-sustaining films of the nature of rubber or nitrocellulose are in general most suitable for forming the smudge proof film coating of this invention.

However, these resins also must be soluble in solvents which are not solvents for the underlying transfer composition, and not soluble in any of the constituents of the underlying transfer composition.

When the transfer composition, for example, consists mainly of an alcohol or water soluble dye, the resin to be used for the protective coating should be insoluble in water or alcohol. For example, if the dye is crystal or methyl violet or fuchsine, then the following solvents would be suitable for application of the coating resin: carbon tetrachloride, benzol, isopropyl ether.

Particularly suitable as materials for protective coatings or transfer sheets containing water or alcohol soluble dyestuffs, are the alkyd resins, the highly chlorinated rubber resins, the solid cumaroneindene resins and cyclized rubber resins obtained from rubber by reacting the rubber in solution with an amphoteric metal halide or chlorostannic acid and isolating the end product.

To prevent excessive hardening of the applied coating, it is generally advisable to include in the coating solution small amounts of plasticizers. For example, castor oil, stearic acid, paraffin wax, or any other non-drying substance which prevent the resinous coating from becoming too hard.

Examples of suitable coating formula are given below:

Preferred formulae

	Percentage composition			
	#1	#2	#3	#4
Resin ("Petrax #1")	4.5	1.8	3.5	1.8
Plasticizer (Stearic acid)	.05		0.3	
(Castor oil)		0.2	0.2	0.2
(Carbon tetrachloride)	95	98	96	
Solvent (Benzene)				48
(Iso propyl ether)				50

In the above formulae "Petrex No. 1" is the trade name of a product of Hercules Powder Co. More particularly, it is a modified alkyd resin made from polybasic acids of the alicyclic series.

Other suitable formulae

		#5	#6	#7	#8	#9	#10	#11	#12
10	Resin								
	"Petrex #1".....	2							2.8
	"Tornesit F".....		1			1			0.2
	"Amberlac D-96".....			2					
	"Neville R-10 Hard resin".....				2			1.8	
	"Pliolite resin".....					1		6.2	
	"Dulux R-C-1".....						2		
15	Solvent								
	(Carbon tetrachloride.....	98	99	98	98			98	47
	Benzene.....					98	98		
	Iso propyl ether.....								50

In the above formulae the following trade names are used.

20 Amberlac D-96—Made by Resinous Products & Chemical Company. Melting range 80–90° C.—a modified alkyd resin—a light amber solid resin.
Neville R-10 Hard Resin—Made by Neville Co.—Coumarone indene resin—light amber solid resin. Melting range 130–150° C.

25 Dulux R-C-1—Made by E. I. du Pont de Nemours & Co. Melting range 95–100° C.—alkyd resin dark greenish solid resin.

Tornesit F—A chlorinated rubber made by the Hercules Powder Co.

30 Petrex #1—A modified alkyd resin made from polybasic acids of the alicyclic series—a product of Hercules Powder Co.

35 Pliolite—Made by Goodyear Tire & Rubber Co.—A cyclized rubber obtained by reacting rubber in solution with an amphoteric metal halide or chlorstannic acid, and isolating the resulting cyclized rubber. A brittle resin. Sometimes called a condensation derivative of rubber, particularly in the Goodyear patents. See viz. U. S. Patent 2,052,391.

Method of application of the above formulae:

Any of the above preparations may be applied in any convenient manner so that after evaporation of the solvent a thin film remains covering the material treated. Generally, it is preferred to dip the carbon sheet, ribbon, etc., into the solution, withdraw it after a few seconds and to dry it by means known to the art. In a warm air current the drying is well-nigh instantaneous.

45 The resinous protective coatings are particularly suitable for dye-carrying impression type transfer sheets and such resin protected transfer sheets offer some very important advantages in liquid or direct process duplication. In that method a dye carrying "master" sheet is prepared by typing or writing on a sheet of suitable paper against a dye carrying impression yielding sheet, so that a design in reverse is produced on the back of the master sheet. This master sheet is then by mechanical means repeatedly brought to contact copy papers, which have been previously moistened with a volatile dye-solvent, so that dye from the impressions on the "master sheet" is transferred to the solvent moistened copy sheets, in such manner that copies are produced of the matter written on the master sheet. By this process several hundred readable copies may be obtained, but after 150–250 copies the "master sheet" becomes moistened with dye solvent, which partially dissolves some of the dye at the base of the dye carrying impressions on the master sheet, causing these to spread out and smudge, whereby the copies are greatly impaired.

75 This is particularly objectionable when a com-

paratively less volatile solvent is used, such as for example water, to which may have been added a surface tension reducing agent to assist in spreading of the solvent.

However, when a protective coating is employed, according to this invention, the base of the dye carrying impression on the master sheet consists of the material of this protective coating as shown in Fig. 3. Since this coating material would generally be insoluble in all solvents used or contemplated for liquid process duplication, it prevents access of the solvent to the dye, and consequently also prevents such deterioration of the master imprint as usually occurs after 150–250 copies due to deterioration of the dye.

Resinous protective coatings may also be applied to other impression type transfer sheets than those carrying dye stuffs. However, when the transfer composition contains an oleaginous or waxy material, it is necessary to use resins which are soluble in a solvent which does not appreciably dissolve or soften the oleaginous or waxy materials. One type of transfer sheet which is particularly important at the present date is the so-called printing process carbon paper. This is a carbon paper which contains no pigment and which may or may not contain a dye stuff. Its essential ingredient is a soft oily or waxy material which is transferable to a contacting surface by the application of pressure or impact such as may be produced by a pencil or a typewriter, and which gives an imprint on the contacting surface which is adherent and highly ink-absorbent. These printing process transfer sheets, however, are so sensitive to pressure and impact that they tend to give imprints from other causes than the impact of the keys of the typewriter. Such other causes are, for example, a casual pressure from the operator's hands or a pressure from the roller of the typewriter. When the copy obtained is used as means of ink transfer in a printing process all such non-intentional impressions will also become inked, and cause ink or smudge on the copy sheets.

As far as is known, printing process carbon papers have not hitherto been made which are substantially smudge proof.

In accordance with this invention printing process carbon papers are coated with a protective coating of a resin which is applied dissolved in a solvent which does not dissolve the oleaginous material of the transfer compositions.

The following example will illustrate the invention as applied to printing process carbon paper:

In coating the printing process transfer sheet a .2% solution of shellac in ethyl alcohol is spread over the transfer sheet, and the solvent subsequently evaporated at a temperature lower than the melting point of the transfer coating.

While there have been shown and described certain forms of the invention, it is to be understood that it is capable of many modifications. Changes, therefore, may be made without departing from the spirit and scope of the invention as described in the appended claims, in which it is the intention to claim all novelty inherent in the invention as broadly as possible, in view of the prior art.

We claim:

1. A transfer medium adapted for use with a pressure or impact instrumentality such as a pencil or the keys of a typewriter comprising a base coated with a pressure or impact transferable composition, and a film essentially com-

prising resin coated on said transfer composition, said film being of such character that it will break and be transferred to a contacting sheet with the transfer composition when pressure or impact is applied to the transfer sheet by a pencil or the keys of a typewriter in the usual manner, of such adhesive character that it will adhere to the contacting sheet and to said base transfer composition, of such solubility that it will dissolve in solvents which are not solvents for the base transfer composition.

2. A transfer medium adapted for use with a pressure or impact instrumentality such as a pencil or the keys of a typewriter comprising a base coated with a pressure or impact transferable composition, and a film essentially comprising resin coated on said transfer composition, said film being of such character that it will break and be transferred to a contacting sheet with the transfer composition when pressure or impact is applied to the transfer sheet by a pencil or the keys of a typewriter in the usual manner, of such adhesive character that it will adhere to the contacting sheet and to said base transfer composition, of such solubility that it will dissolve in solvents which are not solvents for the base transfer composition, the resin of said film being of the class of natural and synthetic resins which are of sufficiently high molecular weight to be frangible non-smearing solids.

3. A transfer medium adapted for use with a pressure or impact instrumentality such as a pencil or the keys of a typewriter comprising a base coated with a pressure or impact transferable composition and a pressure or impact transferable film essentially comprising an alkyd resin, coated on said transfer composition.

4. A transfer medium adapted for use with a pressure or impact instrumentality such as a pencil or the keys of a typewriter comprising a base coated with a pressure or impact transferable composition and a pressure or impact transferable film essentially comprising a chlorinated rubber coated on said transfer composition.

5. A transfer medium adapted for use with a pressure or impact instrumentality such as a pencil or the keys of a typewriter comprising a base coated with a pressure or impact transferable composition and a pressure or impact transferable film essentially comprising a condensation derivative of rubber coated on said transfer composition.

6. A transfer medium adapted for use with a pressure or impact instrumentality such as a

pencil or the keys of a typewriter comprising a base coated with a pressure or impact transferable composition, containing soluble dye, and a film essentially comprising resin coated on said transfer composition, said film being of such character that it will break and be transferred to a contacting sheet with the transfer composition when pressure or impact is applied in the usual manner, of such adhesive character that it will adhere to the contacting sheet and to said base transfer composition, of such solubility that it will dissolve in solvents which are not solvents for the base transfer composition.

7. A transfer medium adapted for use with a pressure or impact instrumentality such as a pencil or the keys of a typewriter to produce reinkable impression on a contacting sheet, said transfer medium comprising a base coated with a pressure or impact transferable composition containing a waxy or oily ink absorbent material, and a film essentially comprising resin coated on said transfer composition, said film being of such character that it will break and be transferred to a contacting sheet with the transfer composition when pressure or impact is applied in the usual manner, of such adhesive character that it will adhere to the contacting sheet and to said base transfer composition, of such solubility that it will dissolve in solvents which are not solvents for the base transfer composition.

8. A transfer sheet designed for use in a typewriter to produce reinkable oleaginous impressions on a contacting sheet, said transfer sheet having a substantially pigment free oleaginous coating and a pressure or impact transferable coating on said first coating comprising shellac.

9. A transfer medium adapted for use with a pressure or impact instrumentality such as a pencil or the keys of a typewriter to produce reinkable impressions on a contacting sheet, said transfer medium comprising a base coated with a pressure or impact transferable composition containing a waxy or oily ink absorbent material, and a film layer comprising primarily a resin and a plasticizer on said transfer composition, the resin being present in such amount as to secure substantially increased adhesiveness as compared to the oily or oleaginous material of the first coating, and the plasticizer being present in such amount as to render the second coating transferable with the first coating by pressure or impact.

JOHAN BJORKSTEN.
WILLIAM J. CHAMPION.