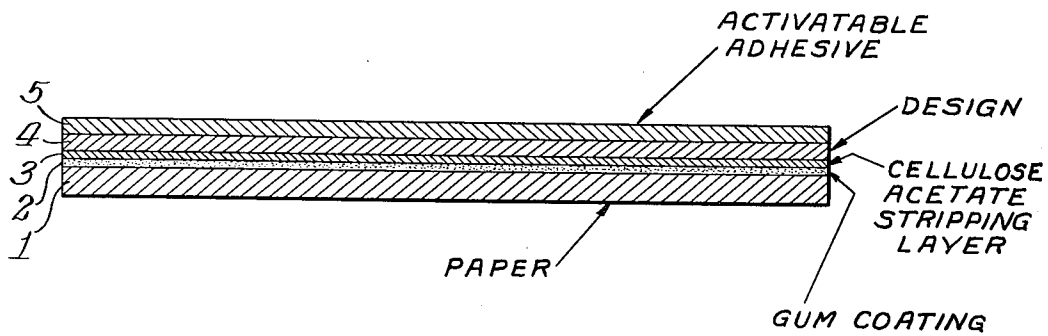


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DRY STRIP TRANSFER
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DRY STRIP TRANSFER

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This invention relates to improvements in transfers or decalcomanias and more particularly to a novel dry strip transfer.

Heretofore in the decorative transfer art, one of the most frequently used types of decalcomanias or transfers has been the so-called water releasable transfer. In this transfer the design layer is printed upon the coated side of an absorbent paper carrier or backing having a coating of a water soluble adhesive. In using this type of transfer, the entire transfer is usually wetted with water which soaks through the paper backing and dissolves or softens the adhesive coating sufficiently to permit the design layer to be slid from the paper backing onto the surface being decorated. The water soluble adhesive coating adheres in part to the released design layer and serves to bond the design layer to the surface being decorated. In other instances, the opposite or outermost surface of the design layer is first adhered by special bonding means to the surface being decorated and thereafter the paper backing is soaked with water and removed. In either mode of application, however, it is necessary that the absorbent paper backing be thoroughly soaked with water in order to release the design layer.

Although the water release principle has been accepted practice in the transfer art for many years, there has been an increasing demand for a transfer which can be applied without the use of water. Aside from the obvious inconvenience and messiness of the water soaking operation, there are frequent occasions and applications where the presence of water cannot be tolerated. Moreover, the water release type of transfer requires a rather specialized type of highly absorbent paper backing which materially increases the cost of the transfer.

In an attempt to overcome the disadvantages of the water release transfer and to meet the growing demand for a dry strip transfer, certain suggestions have been made prior to my invention but these proposals have not provided an entirely satisfactory solution to the problem. For example, one such proposal relies on the well-known release properties of polyethylene in order to obtain a dry strip relation between the transfer backing and the design layer. However, polyethylene is a relatively expensive material, its availability is often restricted, and the polyethylene coated papers which are most often used in such transfers are highly specialized items with limited sources of supply. Other proposals for dry strip transfers have involved the use of various vinyl resin films to obtain a dry strip relation with a lacquer design layer. These vinyl resins are likewise relatively expensive materials and require the preparation of specially coated papers for their most efficient utilization. In addition, polyethylene or vinyl resin films are not entirely suitable for use in transfers involving heat application (i. e. where the design layer is bonded to the surface being decorated by the application of heat and pressure) because of the tendency of these films to soften at elevated temperatures and thereby interfere with proper dry strip release.

I have discovered that, by means hereinafter explained,

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it is possible to obtain a highly effective dry strip transfer using only readily available materials which are relatively inexpensive and which do not involve any substantial departure from the manufacturing techniques and practices which are highly developed and well known in the decalcomania or transfer arts.

Accordingly, a primary object of my invention is to provide a novel and improved dry strip transfer.

A further object of the invention is to provide a novel dry strip transfer utilizing relatively inexpensive and conventional transfer ingredients and which can be readily manufactured by the prevailing manufacturing techniques.

Another object of the invention is to provide a novel dry strip transfer which is readily adapted for use both by heat application and by other application methods.

An additional object of the invention is to provide a novel dry strip transfer which permits the use of an inexpensive and commonly available carrier.

Other objects and advantages of the invention will become apparent from the following detailed description, particular reference being made to the accompanying drawing which is a diagrammatic cross-sectional view on an enlarged scale of a dry strip transfer constituting one specific embodiment of my invention.

Broadly speaking, my invention is based on the discovery that by proper precautions a simple and highly effective dry strip relation can be obtained between an ordinary gum, such as dextrine, and a resinous film-forming material of the type extensively used in lacquers, namely, cellulose acetate.

Heretofore in the art, when a resinous film such as a cellulose acetate film has been deposited in contact with a gum coated backing, it has been considered necessary to include relatively large amounts of plasticizer in the film in order to impart a high degree of flexibility or pliability. I have found that the excessive plasticizer content of such a cellulose acetate film is responsible for the high degree of affinity of the film for the gum coating with the result that release of the transfer carrier or backing is possible only by softening or dissolving the gum coating with water. However, by limiting the amount of plasticizer to a certain maximum amount, or by omitting the plasticizer entirely in some cases, the affinity of the cellulose acetate film for the gum coating is so greatly diminished that a highly effective dry strip relation is obtained.

The resinous films which have heretofore been deposited on gum coated paper backings have generally been formed by applying various lacquer formulations in thin layers over the gum coated paper. The ingredients of such a lacquer include a resinous film-forming material such as cellulose acetate, a plasticizer for the cellulose acetate, and a solvent. In addition, various other modifying resins which are compatible with cellulose acetate may also be added in order to increase the solids content of the lacquer and also to improve the hardness, water resistance, or other properties of the ultimate lacquer film. However, the content of plasticizer or resin or both in the previously used lacquers has always been sufficiently high so that the final dry lacquer film possessed a very marked affinity for the gum coating thereby completely precluding a dry strip relation therebetween.

I have discovered that in the case of cellulose acetate films there is in fact very slight affinity of the cellulose acetate alone for dextrine or other comparable gum coatings and that it is only the presence of excessive amounts of modifying ingredients, including plasticizers and/or resins, which prevents the utilization of this fundamental lack of affinity. My experiments have shown that if the plasticizer and/or modifying resin content of the dry cellulose acetate lacquer film is not allowed to exceed a certain maximum amount, then the desired dry strip relation is effectively obtained. In general, the desired dry

strip relation has been found to exist if the cellulose acetate in the dry lacquer film comprises not less than about $\frac{2}{3}$ by weight of the film. In other words, the weight ratio of cellulose acetate to the other modifying ingredients of the final dry film (including plasticizers and modifying resins) should not be less than about 2:1. Stated otherwise, the total plasticizer and/or modifying resin content of the final dry cellulose acetate film should not be more than about $\frac{1}{3}$ by weight of the film.

Referring now to the drawing, which illustrates a preferred embodiment of my invention, the backing or temporary carrier for the transfer is designated at 1 and comprises an ordinary inexpensive grade of commercial paper known as "label stock" and having a gum coating 2 which is preferably dextrine, although other comparable complex carbohydrate gums function equally as well. This type of paper is the kind used in the printing of ordinary gummed labels and is, therefore, considerably less expensive than the "water leaf" or other special unsized and highly water absorbent papers necessary for use in transfers of the water releasable type. Directly over the gum coating 2 is a thin stripping film or layer 3 of cellulose acetate. In order to insure a readily releasable dry strip relation between the layers 2 and 3, it is important that the cellulose acetate content of the layer 3 be substantially in excess of the plasticizer and/or modifying resin components of this layer. Preferably, the cellulose acetate comprises not less than about $\frac{2}{3}$ by weight of this film, as hereinbefore disclosed. Or in other words, the weight per cent cellulose acetate in the film 3 is at least about twice the percentage of the other modifying ingredients of this film including plasticizers and/or modifying resins.

It will be understood that the layer 3 may be applied over the gum coating 2 by any of the well known methods including roll coating, brushing, spraying, knife spreading, and screen printing.

Inasmuch as the layer 3 functions primarily to provide a releasable film or stripping layer from which the gum coated paper backing may be readily dry stripped, the layer 3 may, therefore, be as thin as is conveniently possible. For example, a thickness on the order of .0002 inch is quite adequate for this stripping film. Because of its limited plasticizer content the stripping layer 3 tends to be somewhat more brittle or less flexible than the remainder of the transfer but by keeping the layer as thin as possible this lesser degree of flexibility does not interfere with the normal usage of the transfer.

Generally speaking, the types of cellulose acetate which may be used in the layer 3 are those suitable for lacquer formulation having an intermediate degree of acetylation and a relatively low viscosity range. For example, the cellulose acetate manufactured by the Hercules Powder Company under the designation LL-1 having from 55.0 to 56.0% combined acetic acid and a viscosity range of 2 to 4 seconds (falling ball method) is quite satisfactory.

The cellulose acetate is utilized initially in the form of a fluid lacquer including a solvent and modifying ingredients such as plasticizers and/or other resins compatible with cellulose acetate. Any of the suitable plasticizers well known in the art may be utilized, but for cellulose acetate one of the best single plasticizers is methyl phthalyl ethyl glycollate. Other phthalate esters are also particularly useful with cellulose acetate, e. g. dimethyl phthalate.

The modifying resins which may be included in the lacquer formulation are desirable in many cases in order to increase the solids content of the lacquer without increasing the viscosity thereof. Such modifying resins should, of course, be compatible with cellulose acetate, and among the modifying resins which may be used with good effect are various alkyd resins such as Rezyl 14 and others of this general type manufactured by American Cyanamid and Chemical Corp., acrylic ester resins such as the Acryloids manufactured by Rohm & Haas Com-

pany, and the aryl sulfonamide type resins such as the Santolites manufactured by Monsanto Chemical Company.

The structure of the transfer is completed by a design layer or film 4 which may be a decorative imprint of any suitable character deposited on the stripping layer 3. As is well known in the transfer art, the design 4 is in many cases a multi-component or compound layer and may be formed by screen printing or gravure printing or otherwise depositing different colored nitrocellulose lacquers to provide the desired design configuration.

In using my transfer, the design layer 4 is first adhered by suitable means to the surface being decorated and thereafter the paper backing is removed in a simple dry stripping operation with the separation occurring between the layers 2 and 3. Thus, after the transfer design has been applied the stripping layer 3 constitutes the outermost exposed surface of the decoration. However, the layer 3 being a clear lacquer and being preferably quite thin, the desired design effect is readily obtained and the outermost layer 3 then serves to some extent as a protective covering for the applied design.

In order to facilitate bonding of the design layer 4 to the surface being decorated, I prefer in most instances to provide a special covering lacquer layer 5 over the design layer 4. The layer 4 may be activated by heat or by means of a suitable solvent in order to develop adhesive properties therein and thereby secure the transfer design to the surface. By way of example, a suitable clear lacquer for the activatable adhesive layer 5 may contain equal parts by weight of nitrocellulose, a maleate resin such as Amberol 801 manufactured by Rohm & Haas, and blown castor oil. If the transfer is of the type adapted for heat application, the outer layer 5 may frequently be omitted and instead an equivalent lacquer layer on the surface being decorated is activated by heat during application of the transfer design so that the design layer 4 is bonded to the surface in the same general manner. Heat application is frequently resorted to in the decoration of wood surfaces such as radio cabinets and other articles of furniture. In such instances, the wood surface is normally finished with a special lacquer and this lacquer layer is sufficiently activated by heat to effect the desired bond to the design layer 4 of the transfer.

In other situations, a solvent is employed to accomplish the bonding of the transfer design, the solvent first being applied to the surface of the article and the transfer design then being impressed in place. In this case, it is usually preferable to provide an outer activatable layer 5 in the transfer, and the application of the solvent serves to activate both the layer 5 and also any lacquer coating which may be present on the surface being decorated.

Insofar as heat application is concerned, the present invention affords substantial advantages over many of the dry strip transfers which have been proposed heretofore. The use of heat has no harmful softening effect on the gum coating 2 and consequently the temporary paper backing 1 is readily released. In other types of dry strip transfers, the application of heat tends to soften the polyethylene or vinyl resin release layer to the extent that an effective dry strip relationship is not always obtained. In the case of solvent application of the transfer of the present invention, it is highly desirable that the gum coated paper backing be stripped from the design as soon as possible after application of the design to the surface. Otherwise, there is a tendency for the solvent to penetrate through the design layer 4 to the thin stripping layer 3 so that the latter becomes softened and tacky thereby interfering with proper dry strip removal of the carrier. If it is not possible or desirable to remove the carrier promptly after application of the design film, then it is necessary to allow ample time for the solvent to completely evaporate. A period of several hours is usually quite adequate to insure evaporation of the solvent. Obviously, after the solvent has completely evaporated any

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softening effect on the stripping layer 3 will have been eliminated and the gum coated carrier can then be dry stripped in the usual manner.

It will be understood that the design layer 4 and the activable adhesive layer 5 may be formed by any of the conventional techniques referred to above for forming lacquer films.

For the purpose of illustration, but not by way of limitation, the following specific examples are presented of lacquer formulations which are particularly effective for forming the stripping layer 3 in my invention. In each case cellulose acetate is the resinous film-forming ingredient of the layer 3, and it will be understood that the remaining layers or elements of the transfer may be formed as hereinbefore described.

Example I

A preferred lacquer formulation for the stripping layer contains the following ingredients in the indicated proportions:

Ingredients	Wt. Per-cent
Cellulose Acetate (Hercules LL-1).....	16.7
Methyl Phthalyl Ethyl Glycollate (Santicizer M-17).....	5.5
Aryl Sulfonamide Formaldehyde Amine Resin (Santolite MHP).....	2.8
Solvent.....	75.0
	100.0

As will be readily apparent from the foregoing, the cellulose acetate content of the film ingredients remaining after evaporation of the solvent is approximately twice as great as the combined plasticizer and modifying resin content of the film. In accordance with the principles of my invention, this particular film affords an excellent dry strip relation when disposed directly against a dextrine coated paper.

Although any suitable solvent or mixture of solvents may be used in the above formulation, it is usually desirable to employ a multi-component solvent in order to provide the desired volatility characteristics. Where a fast evaporating solvent is desired, I have found that the following mixture is especially effective in the above identified formula:

Ingredients	Wt. Per-cent
Acetone.....	81.8
Methyl Alcohol.....	9.1
Methyl Cellosolve Acetate.....	9.1
	100.0

Example II

In the event that a slow evaporating solvent is desired for the lacquer formulation described in Example I, the following combination is particularly useful:

Ingredients	Wt. Per-cent
Diacetone Alcohol.....	48.6
Methyl Cellosolve Acetate.....	28.6
Denatured Alcohol.....	11.4
Xylol.....	11.4
	100.0

The above solvent is used in the same proportion specified in Example I.

Example III

If desired, the modifying resin ingredient may be omitted entirely from the lacquer formulation described

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in Example I. In this event, the formulation may be as follows:

Ingredients	Wt. Per-cent
Cellulose Acetate (Hercules LL-1).....	16.7
Methyl Phthalyl Ethyl Glycollate (Santicizer M-17).....	8.3
Solvent.....	75.0
	100.0

Example IV

As another alternative formulation, the plasticizer ingredient as set forth in Example I may be omitted entirely in certain instances. In that case, the lacquer formulation may be as follows:

Ingredients	Wt. Per-cent
Cellulose Acetate (Hercules LL-1).....	16.7
Aryl Sulfonamide Formaldehyde Amine Resin (Santolite MHP).....	8.3
Solvent.....	75.0
	100.0

Although the invention has been described above with particular emphasis on certain specific or preferred embodiments, it is to be understood that various modifications and equivalent materials may be employed without departing from the scope of the invention as defined in the appended claims.

I claim:

1. A dry strip transfer comprising a carrier, a gum coating on said carrier, a separable stripping layer directly against said gum coating, said stripping layer containing a major proportion by weight of cellulose acetate and a relatively minor amount of a modifying ingredient insufficient to cause strong adherence of the cellulose acetate to said gum coating whereby said stripping layer is readily releasable from said gum coating by dry stripping, and a design film over said stripping layer.
2. A dry strip transfer comprising a carrier, a gum coating on said carrier, a cellulose acetate lacquer layer directly against said gum coating, the total content of plasticizer and other modifying ingredients in said lacquer layer being restricted to a minor amount insufficient to cause an adherent bond between the cellulose acetate lacquer layer and said gum coating whereby said lacquer layer is readily releasable from said gum coating by dry stripping, and a design film over said stripping layer.
3. A dry strip transfer comprising a carrier, a gum coating on said carrier, a cellulose acetate layer directly against said gum coating, the cellulose acetate constituting not less than about $\frac{2}{3}$ by weight of said layer whereby said layer is readily releasable from said gum coating by dry stripping, and a design film over said layer.
4. A dry strip transfer comprising a carrier, a gum coating on said carrier, a cellulose acetate lacquer layer directly against said gum coating, the weight ratio of cellulose acetate to other modifying ingredients in said layer being not less than about 2:1 whereby said layer is readily releasable from said gum coating by dry stripping, and a design film over said layer.
5. A dry strip transfer comprising a paper backing, a gum coating on said paper, a separable stripping layer directly against said gum coating, said stripping layer containing a major proportion by weight of cellulose acetate and a relatively minor amount of at least one modifying ingredient insufficient to cause strong adherence of the cellulose acetate to said gum coating whereby said stripping layer is readily releasable from

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said gum coating by dry stripping, and a design film over said stripping layer.

6. A dry strip transfer comprising a carrier, a dextrine coating on said carrier, a separable stripping layer directly against said dextrine coating, said stripping layer containing a major proportion by weight of cellulose acetate and a relatively minor amount of at least one modifying ingredient insufficient to cause strong adherence of the cellulose acetate to said dextrine coating whereby said stripping layer is readily releasable from said dextrine coating by dry stripping, and a design film over said stripping layer.

7. A dry strip transfer comprising a temporary paper carrier, a dextrine coating on said paper carrier, a separable cellulose acetate lacquer layer directly against said dextrine coating, the weight ratio of cellulose acetate to total modifying ingredients in said lacquer layer being not less than about 2:1 whereby said lacquer layer is readily releasable from said dextrine coating by dry stripping, and a design film over said lacquer layer.

8. The article of claim 7 further characterized in that said paper carrier comprises ordinary label stock.

9. The article of claim 7 further characterized in that said lacquer layer consists essentially of cellulose acetate, a plasticizer for the cellulose acetate, and a modifying resin compatible with the cellulose acetate.

10. The article of claim 7 further characterized in that said lacquer layer consists essentially of cellulose acetate and a plasticizer therefor.

11. The article of claim 7 further characterized in that said lacquer layer consists essentially of cellulose

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acetate and a modifying resin compatible with cellulose acetate.

12. A dry strip transfer comprising a carrier, a gum coating on said carrier, a separable stripping layer directly against said gum coating, said stripping layer containing a major proportion by weight of cellulose acetate and a relatively minor amount of a modifying ingredient insufficient to cause strong adherence of the cellulose acetate to said gum coating whereby said stripping layer is readily releasable from said gum coating by dry stripping, a design film over said stripping layer, and an outermost activatable adhesive layer for adhering the design film to a surface to be decorated.

13. A dry strip transfer comprising a temporary paper carrier, a dextrine coating on said paper carrier, a separable cellulose acetate lacquer layer directly against said dextrine coating, the weight ratio of cellulose acetate to total modifying ingredients in said lacquer layer being not less than about 2:1 whereby said lacquer layer is readily releasable from said dextrine coating by dry stripping, a design film over said lacquer layer, and an outermost activatable adhesive layer for securing the design film to a surface to be decorated.

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