

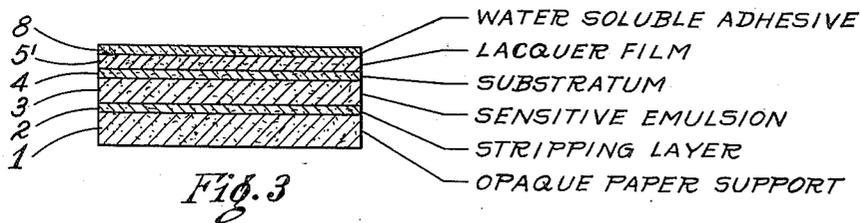
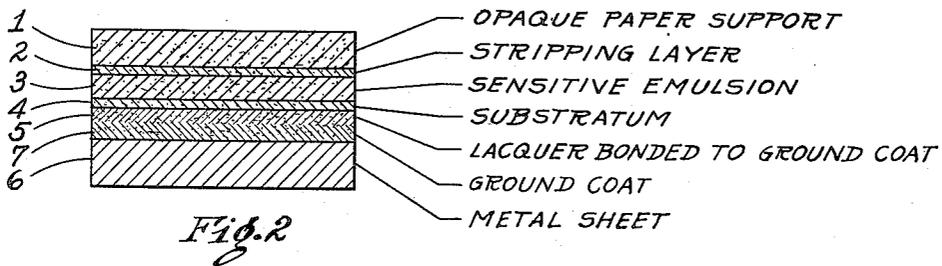
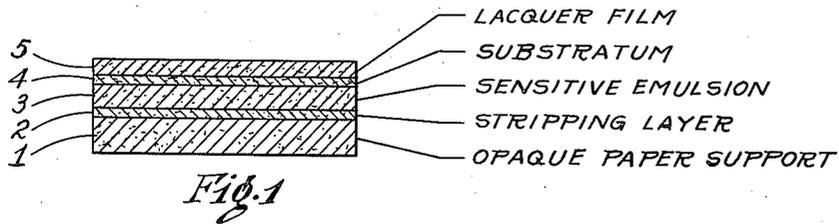
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PHOTOSENSITIVE TRANSFER

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PHOTOSENSITIVE TRANSFER

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1 Claim. (Cl. 95-8)

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This invention relates to photosensitive transfer materials or stripping films and more particularly to photosensitive transfers adapted to apply photosensitive materials to sheets of metal, glass, plastics and the like.

In carrying out lofting operations in the manufacture of aircraft and for other purposes, it is frequently necessary to reproduce drawings and other material on the surfaces of sheets of metal, glass, plastics and the like, these sheets being used, for example, in the production of templates, jigs and the like. The drawings are frequently of large size, and while they can be reproduced conveniently by photographic methods, the coating of uniform, useable layers of photosensitive emulsions onto large surfaces is a difficult and expensive procedure, requiring special coating machines and other costly and bulky equipment. However, photosensitive emulsions can be coated on large sheets or webs of paper uniformly and economically by well established methods, and then transferred to other materials.

It is therefore one of the objects of the present invention to provide photosensitive transfer materials embodying sensitive emulsions coated on suitable base materials such as paper, and constructed and arranged so that the emulsion can readily be applied to metallic or other sheets. Another object is to provide such materials which can be applied without requiring special equipment or highly skilled labor. Another object is to provide a photosensitive transfer in which the sensitive emulsion is protected from light after it is applied to the base. Another object is to provide such a material in which the paper support may be stripped from the sensitive emulsion without requiring the use of any water or other solvent material. Another object is to provide photosensitive transfers which may be applied to glass, plastic or other transparent plates. A further object is to provide photosensitive transfers which can be handled in ordinary light until they are finally prepared for exposure.

Further objects and advantages of my invention will become apparent from the following description of a preferred form thereof, reference being made to the accompanying drawing in which Figure 1 is a section, with the thickness of the layers greatly exaggerated and not necessarily in proper proportion, showing a transfer in accordance with my invention; Figure 2 is a similar section showing the transfer of Figure 1 applied to a metal sheet; and Figure 3 is a similar section showing a slightly modified form of transfer.

As shown in Figure 1, the transfer is built up in the manner of a decalcomania by applying successive coatings to a temporary support such as a sheet or web 1, the coating operations being

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carried out in known manners as by roll coating or the like, the web being dried if necessary between successive coating operations. The successive coatings comprise the stripping layer 2, the photosensitive emulsion 3, the substratum 4 and the backing film 5. The transfer is applied to the material to be sensitized, such as the sheet 6, face down as shown in Figure 2, and the sensitized sheet is made ready for use merely by stripping the opaque paper support 1 therefrom.

Preferably the support 1 comprises a web of opaque black paper. Black or other opaque paper is employed so that when the transfer is applied to an opaque base, the sensitive emulsion will be protected from light from both sides. Thus the sensitized metal or other opaque material to which the transfer is applied may be handled in ordinary light until the paper is stripped therefrom. I preferably employ an absolutely opaque 90 pound black paper, of fairly long fiber and fairly high tensile strength, which has been supercalendered to provide a smooth finish. The paper should have sufficient strength to resist tearing as it is being stripped from the transfer, and is preferably clay coated to prevent substantial penetration of the materials forming the stripping layer into the paper.

The first operation on the paper is to apply to it a water insoluble stripping layer 2 which is very thin, preferably having a thickness of about .001 inch and which furnishes a smooth foundation for the succeeding layer of the transfer. The following is a preferred formula for a nitrocellulose stripping lacquer:

Material:	Parts by weight
Lactol spirits.....	13.5
Amsco "A".....	20
Butanol.....	2
Ethyl acetate.....	10
Paraplex RG-7.....	4
20 second nitrocellulose 13% solution in—	
60% butyl acetate.....	} 36
25% Amsco-A.....	
15% Lactol spirits.....	

"Amsco A" is a hydrogenated naphtha manufactured by The Ohio Mineral Spirits Company, of Cleveland, Ohio. "Paraplex RG-7" is a plastic alkyd resin manufactured by Resinous Products Company, of Philadelphia, Pennsylvania.

Other water insoluble materials, such as various lacquers and the like, may be used as stripping layers if desired. The materials should be such that the emulsion will not adhere strongly to the stripping layer and the materials must not damage the emulsion. Thin films or layers of materials such as ethyl cellulose, polyvinyl acetate, butyl butyrate and the like may be employed. A suitable dry stripping lacquer of the

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ethyl cellulose type may be made according to the following formula:

Material:	Parts by weight
Ethyl cellulose N-14	2 1/4
Xylol	4
Toluol	4
Alcohol-C. D.	1
Butanol	1

Ethyl Cellulose N-14 is a medium viscosity ethyl cellulose manufactured by Hercules Powder Company, of Wilmington, Delaware.

The nitrocellulose and ethyl cellulose stripping lacquers given in the foregoing formulae will provide glossy foundations on which the emulsions may be coated. However, if desired, flattening agents may be incorporated in the stripping layer. This may be accomplished by including in the above stripping lacquers, materials such as diatomaceous earth, silica, ground quartz and the like. The presence of a flattening agent in the stripping layer gives the emulsion layer which is coated thereon a flat or matte surface which is desirable for subsequent drawing on a developed-out print produced on a metallic or other sheet.

The sensitive emulsion indicated at 3 is applied directly over the stripping layer and may be any suitable photographic emulsion depending upon the requirements of the work to be reproduced. With my preferred formulae, adhesion between the nitrocellulose or ethyl cellulose lacquer making up the stripping layer and the emulsion is such that the layers may be readily separated or stripped from each other without requiring the use of water or any other solvent, but the layers adhere sufficiently to prevent accidental displacement or stripping during handling of the transfers. The water-insoluble, substantially moisture proof stripping layer is highly advantageous in the emulsion coating operation, for it prevents moisture from the emulsion from reaching the paper. Thus cockling and wrinkling of the paper are eliminated. The stripping layer also substantially prevents humidity from reaching the emulsion after the manufacturing operations are completed, thus eliminating one of the important factors contributing to the deterioration of photographic emulsions.

Next, a substratum 4 of gelatin and cellulose is coated on the photographic emulsion 3, the function of this being to bond the emulsion to the lacquer layer or backing film 5 which is applied to the substratum. The substratum is preferably made according to the following formula:

Material:	Parts by weight
Gelatin	1
RS 1/2° nitrocellulose	2
Glacial acetic acid	5
Methanol	500

The backing film 5 may be composed of any suitable lacquer such as the transfer films disclosed in my Patent No. 1,893,785, for example, or made according to the following formula:

Material:	Parts by weight
25% solution RS 1/2° nitrocellulose in	32
50% butyl acetate	
50% tollac	
Titanium dioxide	27
Amberol #801	2 1/2
Paraplex R.G-2	6
Dibutyl phthalate	2
Butyl acetate	7

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Material:	Parts by weight
Butanol	2
Ethyl acetate	4
Tollac	13

"Tollac" is an aromatic hydrocarbon manufactured by The Neville Company, Neville Island, Pennsylvania. "Amberol 801" is a maleic type resin manufactured by Resinous Products Company, of Philadelphia, Pennsylvania, and "Paraplex R.G-2" is a plastic alkyd resin also manufactured by Resinous Products Company.

The backing film 5 supports the emulsion and protects it from abrasion and moisture, and also provides a medium for bonding the emulsion to the sheet material to which the transfer is ultimately applied. For most purposes a light-colored lacquer, such as produced by the formula above, is employed. When the transfer has been applied, exposed and developed, the light-colored lacquer provides an appropriate background forming a contrast with the black of the developed photographic image. I also contemplate that the backing film may be made opaque by applying, for example, further coatings of pigmented lacquer over the light-colored lacquer so that in the transfer the emulsion will be disposed between the opaque paper and an opaque layer of lacquer. Such a transfer can be handled in ordinary light without danger of exposing the emulsion.

For other purposes it may be desirable to employ a transparent or translucent backing film. Transparent or translucent films are useful in some instances where the transfers are to be applied to glass or other transparent or translucent materials and also in some lofting procedures wherein it is frequently necessary to resensitize a portion of a panel or to apply a further sensitized transfer over a scribed or drawn panel to add some additional lines or details photographically. Transfers embodying clear backing films may be used very satisfactorily for such purposes.

It is sometimes desirable to incorporate a flattening agent in the backing film. For example, silica may be added to the formula above to give the film a "tooth" so that it can be drawn upon with pencil or silver stylus without difficulty. Such materials are useful in lofting procedures where a print is made of the main contours and these are traced and scribed through the transfer and ground coated to the metal base itself, then the emulsion is completely removed with "Chlorox" or other mild alkaline solution thus exposing the lacquer backing of the transfer which will provide a suitable surface for further drawing by reason of the incorporation of the silica or other flattening agent.

In Figure 2, the transfer is shown as applied to a metal sheet 6 having a lacquer ground or priming coat 7 thereon. As indicated diagrammatically in the drawing, the backing film 5 is bonded to the ground coat 7, thus permanently mounting the transfer on the base metal sheet 6. This bonding operation may be accomplished in various ways, but I preferably employ a process such as that described in my aforesaid Patent No. 1,893,785 wherein a ground coat is applied to the metal sheet and a solvent liquid then applied to the ground coat, the solvent being such that it will act on both the ground coat or primer 7 and the backing film 5 so that when the lacquer film 5 of the transfer is applied to the solvent-coated ground coat, the surfaces of both the

ground coat and the lacquer will be softened, and upon dissipation of the solvent, the lacquer will be permanently bonded to the ground coat. Suitable formulas for primers or ground coats are given in my aforesaid patent, and with nitrocellulose lacquer backing films I preferably employ as a solvent a solution of ethyl lactate and water such as disclosed in my said prior patent. Obviously other solvents, not necessarily miscible in water, may be employed.

It will be obvious that other methods of attaching the transfer to the metal or other sheet may be employed. For example, where it is not practical to apply a ground coat, and in the transfers intended for application to glass, a simple water soluble adhesive, such as a layer of animal glue, may be applied over the pigmented lacquer to furnish a suitable adhesive for mounting the transfer. Such a transfer is shown in Figure 3, wherein the adhesive is indicated at 3. The layers 1, 2, 3 and 4 may be identical with those previously described. As noted above, for a transfer to be applied to glass the lacquer coating 5' may, if desired, be clear rather than pigmented.

The metal or other sheet material with the photosensitive transfer applied thereto as in Figure 2 may be stored for reasonable periods of time without requiring any particular precautions against light, for the photosensitive material is protected by the black paper. Thus the material can be handled in ordinary light without danger of fogging, and in order to prepare it for use, it is only necessary to strip the black paper from the transfer, leaving the sensitive emulsion as the outer surface of the material. The stripping operation can be carried out readily without requiring any water or other solvents by merely loosening a corner of the paper from the emulsion and pulling it slowly away from the sheet. The stripping layer remains bonded to the paper, leaving the emulsion free from any coating material, thus making it possible to carry out the development and other treatment of the emulsion by ordinary methods. The protection from moisture afforded the emulsion by the stripping layer has a further advantage. If static electricity is present, it can be dissipated by wiping the black paper with a wet sponge without danger of moisture from the sponge reaching the emulsion.

From the foregoing description of preferred forms of my invention, it will be seen that I have provided photosensitive transfers by which sensitive emulsions can be readily applied to materials such as metal sheets, glass plates, plastic sheets and the like. Because of the provision of a black paper backing for my transfer, the opaque sheets with the transfers applied thereto can be handled in ordinary light without danger of fogging the emulsion. If desired, the transfers can be made so that the emulsion is at all times protected from light until the black paper is stripped therefrom just before the exposure is made. The materials may be handled without special equipment and without requiring any great amount of skill. Inasmuch as the paper may be stripped dry from the emulsion, danger of damaging the emulsion is eliminated and the messiness of the usual wet stripping operation is eliminated. The backing films are such as to increase the usefulness of my transfers, and function to protect the emulsion layers and bond the transfers to the underlying sheet.

Various changes and modifications of my invention will be apparent to those skilled in the art. Further, the invention can be adapted to purposes other than those specifically disclosed herein. It is therefore to be understood that the invention is not limited to the preferred forms described in the foregoing specification or in any manner other than by the scope of the appended claim.

I claim:

A photosensitive transfer for application as a unit to a supporting surface, such transfer comprising an opaque paper-base material treated to prevent substantial penetration of subsequently applied materials; a layer of dry-stripping material bonded to and removable with such paper-base material, said dry-stripping material containing a flattening agent which gives the emulsion layer subsequently coated thereon a matte surface for subsequent drawing on the developed-out print and being water-insoluble and substantially moisture proof in that it constitutes a barrier to the transmittal of moisture therethrough; an unexposed layer of light-sensitive photographic emulsion detachably secured to the layer of dry-stripping material, said layer yielding a dark image when exposed; a distinct layer of bonding material, said layer of bonding material being composed of nitrocellulose and gelatine; and, providing a contrasting background for the dark image yielded by the light-sensitive material, a light-colored backing film of the nature of a pigmented lacquer residue, the solid content of the lacquer from which the backing film is formed including nitrocellulose in an amount upward of 10% of such solid content, titanium dioxide, and a siliceous abrasive imparting to the backing film a tooth providing a surface for further drawing on the backing film on removal of the emulsion layer from the supporting surface to which the transfer is applied.

THOMAS S. REESE.

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