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DECALCOMANIA

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Fig. 1.

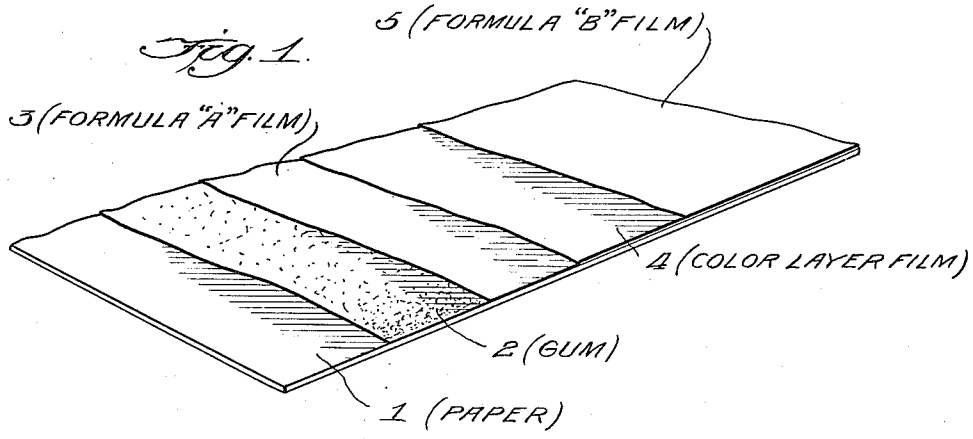


Fig. 2.

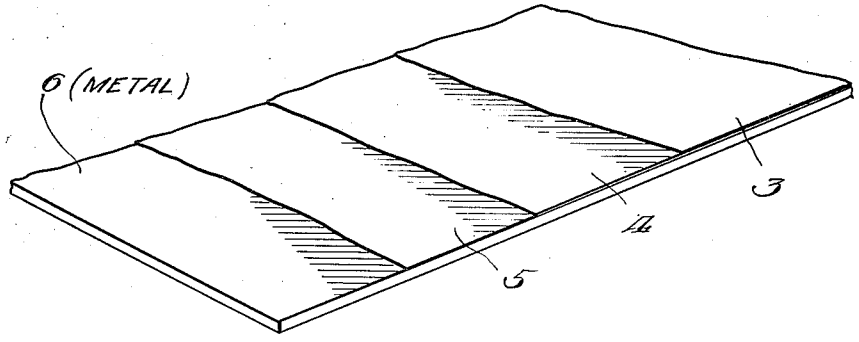
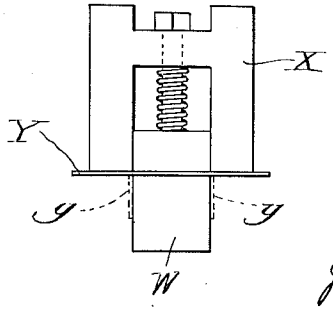


Fig. 3.



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DECALCOMANIA

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7 Claims. (Cl. 41—33)

The present invention relates to decalcomanias and particularly decalcomanias adapted for the decoration of metal. In the case of sheet metal interior trim for automobiles, for example, that requires forming of the sheet metal and the baking of the decorative coatings, the decorating must be done before the forming operation if decalcomanias are employed. The problems met in the use of decalcomanias for decorating such trim have heretofore made the process quite expensive.

The primary object of the present invention is to make it possible successfuly to produce finely finished formed sheet metal parts, decorated with decalcomania films baked on, at a moderate cost.

Heretofore it has been necessary, in order to secure a good product, to apply a ground coat to the metal and then to transfer the decalcomania film to such ground coat. Also, the polishing of the decorated surface has been slow and tedious, as it had to be done on the non-flat surfaces of the work after the forming operation.

A further object of the present invention is to produce a novel decalcomania which may be applied directly to metal without first laying on a ground coat or primary coat; which shall be sufficiently pliable to permit the bending, drawing or working of sheet metal decorated therewith without injury to the decorative film; and which shall be sufficiently hard and tough to make it feasible to polish the film before the forming operation.

By polishing the sheets while they are flat the polishing can be done expeditiously and well, the cost of polishing being low and the effect better than that resulting from polishing after forming.

In carrying out our invention, we produce a decalcomania in the usual way, but employ materials which, we have discovered, will give the desired results. The transferable element of the decalcomania is made in three layers applied, one over the other, upon any usual or suitable transfer paper which is an absorbent paper coated on one side with a water-soluble gum or gums. The first layer to be applied to the coated paper is that which is to constitute the wearing coating of the decorative film, after transfer. Upon this first layer we print or otherwise apply the ink film.

The third or final layer not only gives further body to the film as a whole, but it usually serves as a pigmented ground coat. Thus, for example, if rare woods are to be imitated, the ground coats are pigmented to correspond in color to the ground colors of the woods; the printed or lithographed subjects that constitute the second or ink layers being then of such a nature as to reproduce the grain effect of the woods.

Most excellent results have been obtained with a wearing layer having, with the exception of the solvent or solvents for the whole, the following component parts, to which we shall hereinafter refer as Formula A:

(*a*) Nitrocellulose; 35–45%;

(*b*) Polyhydric alcohol—polybasic acid—unsaturated fatty acid—resin, hereafter referred to as Resin X; 6–10%;

(*c*) Polyhydric alcohol—polybasic acid—castor oil fatty acid (e. g., sebacic, azelaic, undecylenic acids) resin, referred to hereafter as Resin Y; 10–15%;

(*d*) Dewaxed shellac; 6–10%;

(*e*) Plasticizer—e.g., tricresyl phosphate, or diamyl phthalate; 30–35%.

The composition corresponding to the foregoing formula is dissolved in any suitable or usual solvents for nitrocellulose, such as a mixture of ethyl acetate, butyl acetate, butanol and toluol, and it is applied to the transfer paper by spraying, knifing or rolling.

The composition of the ground coat which is applied over the printed or lithographed subject is substantially as follows, this formula being hereinafter referred to as Formula B:

	Percent
(*a*) Nitrocellulose	25–30
(*b*) Resin X	33–38
(*c*) Resin Y	6–10
(*d*) Plasticizer	13–18
(*e*) Castor oil	12–15

The ground composition may be pigmented to any desired color by the usual high strength pigments in sufficient quantity to secure coverage. Such pigments as titanium oxide, zinc sulfide, ferrite yellow, iron oxide, burnt umber, chrome yellow, etc., are usable. Pigments which would discolor at a temperature of approximately 300° F. are not suitable.

A typical suitable formulation for a wearing coat and ground coat is as follows:

(*a*) *Clear first coat*

	Pounds
Nitrocellulose	37½
Resin X	7½
Resin Y	12½
Dewaxed shellac	10
Tricresyl phosphate	32½

Dissolve above in the following solvents to which we shall hereafter refer as Thinner Z:

	Gallons
Butyl acetate	10
Amyl acetate	5
Butanol	10
Absolute alcohol	10
Toluol	10
Xylol	5

(b) Walnut ground coat

	Pounds
Nitrocellulose	30
Resin X	35
Resin Y	7½
Tricresyl phosphate	15
Castor oil	12½

Dissolve in 50 gallons Thinner Z and grind in 20# titanium oxide and 5# ferrite yellow.

When the ink employed in making the ink layer of the decalcomania comprises pigments ground in oil, means should be provided to protect the ink layer against damage by the solvents present in the third or ground layer when the latter is applied. This can conveniently be accomplished by overlaying the ink layer with a light coating of a substance or material produced in accordance with the following formula, before adding the third or ground layer: 2 pounds of cellulose acetate; 6000 c. c. amyl acetate; 2000 c. c. ethyl lactate; 1000 c. c. triacetine; 1000 c. c. diacetone alcohol; and 1000 c. c. acetone; producing 5½ gallons of coating material.

It should be noted that in the composition for the ground coat or layer there may be 50% more of resin than of nitrocellulose and the resin and the plasticizer, together, may be in an amount as much as two and one-half times as great as that of the nitrocellulose. This is for the reason that the nitrocellulose acts merely as a drying agent and has no value, as do the resins and the plasticizers, in giving to the decalcomania the capacity to adhere tenaciously to metal and the necessary flexibility to permit the film to remain intact during the forming of the metal sheet or other member to which the decalcomania may be applied. Without the presence of the nitrocellulose the decalcomania might remain tacky so that it could not be freely handled or stored.

Since baking of the decorative film is necessary after application thereof to the metal, the composition of the film must be such that the film will not deteriorate in baking. When it is attempted to use so-called lacquers that have been employed in making decalcomanias for the wearing coat and the ground coat, decomposition is likely to take place at the high baking temperatures that are desirable. In our improved decalcomania such decomposition is prevented by the large amounts of resin and plasticizer present.

In the use of the decalcomania, after the metal to which the same is to be applied has been degreased, the exposed side of the decalcomania is treated with a substance, compound or mixture of a character to render the ground coat tacky and cause it to adhere tenaciously to a surface against which it may be pressed; and the decalcomania is then applied directly to and pressed against the clean metal surface. Said substance, compound or mixture may, however, be interposed in any other suitable way between the ground coat or layer and the clean metal surface. The simplest course is to dip the decalcomania in a suitable liquid substance, compound or mixture of the proper character; the decalcomania being then laid, in a wet condition, on the metal.

A suitable substance, compound or mixture for causing the ground coat or layer to become tacky, into which the decalcomania may be dipped, or which may be interposed between the decalcomania and the metal, may be made in accordance with the following formula:

2½ gallons of ethyl lactate; 1¼ gallons of ethylene-chlorohydrin; ¼ gallon of ethyl alcohol; and in the neighborhood of 1 gallon of pure clean water. The last three ingredients are preferably mixed together and the ethyl lactate added last.

After the application of the decalcomania to the article to be decorated, the latter is baked at a comparatively high temperature; the paper backing being removed from the decorative film before baking. The baking temperature may vary within considerable limits, although we prefer a baking temperature in the neighborhood of 325° F. However, a somewhat lower or a somewhat higher temperature may be employed.

Following the baking operation, the decorated surface is polished, provided a high polish be desired. In the case of decorated sheet metal which is subsequently to be stamped or formed, the polishing is preferably done while the sheet metal is in a flat condition and before the stamping or forming, since the polishing may be done more effectively and at a great saving in labor cost while the product is flat. We have found in actual practice that one workman can polish in the flat as many sheets as can be polished by five workmen after the sheets have been formed.

Following the stamping or forming of a sheet, a final polish may be given by hand, using liquid polish, and the product is ready for use without any further surface treatment.

It will, of course, be understood that, if for any reason it be desired, one or more coats of lacquer may be applied over the decorative film, either immediately after the decorating process has been completed or later; since lacquer will not injure the baked film.

The invention is illustrated schematically in the accompanying drawing, wherein: Fig. 1 is a perspective view of a fragment of a decalcomania embodying the invention, the various layers above the paper backing being broken away in step formation; Fig. 2 is a perspective view of a fragment of a metal sheet to which the transferable element of the decalcomania has been applied, the several layers of said element being broken away in step formation; and Fig. 3 is an elevational view of a conventionally set of bending dies about to close on the decorated metal sheet to bend the latter.

In Fig. 1 of the drawing in which 1 represents a paper backing sheet having thereon a suitable gum coating 2, the composite transfer film consists of the three layers, 3, 4, and 5; the layer 3 constituting the wearing layer and lying next to the gum coating and the ground coat or layer 5 being uppermost. When the transfer is made to the metal sheet 6, as in Fig. 2, the layer 5 lies on the metal surface, whereas the wearing layer 3 is now uppermost or exposed.

In Fig. 3 of the drawing the decorated and polished metal sheet Y is about to be subjected to a simple bending operation, W and X lower and upper dies. When the sheet Y is placed between the dies and the dies are closed, the ends

of the sheet are bent down as indicated in dotted lines at *y*, causing the sheet to take a trough-like shape.

We claim:

1. The method of decorating metal which comprises cleaning the surface of the latter and applying directly to such surface a decalcomania film having on the side engaged with the surface a layer or coating containing a large proportion of resin, there being interposed between the film and said surface or applied to said layer or coating a volatile liquid capable of rendering the said coating more or less tacky and adhesive in character, pressing the film against the metal, and baking.

2. A decalcomania comprising a transferable film lying face down upon and adhering to a water-soluble gum coating on a porous backing, the film being made in three layers, the inner or lower layer containing a high proportion of resinous and plasticizing materials, the intermediate layer consisting of ink or the like, and the top or outermost layer containing more than 50% of resinous and plasticizing materials.

3. A decalcomania comprising a transferable film lying face down upon and adhering to a water-soluble gum coating on a porous backing, the film being made in three layers, the inner or lower layer containing a high proportion of resinous and plasticizing materials, the intermediate layer consisting of ink or the like, and the upper or outermost layer containing nitrocellulose and an amount of resinous and plasticizing material at least twice as great as the amount of nitrocellulose.

4. The method of producing a formed decorated sheet metal object having a polished surface which comprises cleaning the surface of a flat metal sheet, applying directly to the clean surface of the metal a decalcomania film which contains on the side engaged with the metal a layer or coating containing nitrocellulose and resinous and plasticizing materials in greater quantity than the nitrocellulose and having on the opposite side a forming coating capable of being polished, baking the decorated metal, polishing the exposed face of the film after the application of the film to the metal, and then forming the decorated metal sheet.

5. A decalcomania comprising a transferable film adhering to a water-soluble gum coating on a porous backing, the film containing three layers, the intermediate layer consisting of ink or the like and the other two layers containing a high proportion of resin.

6. A decalcomania comprising a transferable film positioned face down on and adhering to a water-soluble gum coating on a porous backing, the film containing three layers, the inner layer of the film consisting of ink or the like and the other two of said layers including a high proportion of resinous and plasticizing materials.

7. A decalcomania comprising a transfer film adhering to a water-soluble gum coating on a porous backing composed of a wearing layer, an ink layer and a third layer arranged in the order in which they have just been named; said wearing layer comprising from 35% to 45% of nitrocellulose, 16% to 25% of polyhydric alcohol, polybasic acid, unsaturated fatty acid resin, castor oil, from 6% to 10% of dewaxed shellac and from 30% to 35% of plasticizing material; and said third layer comprising from 25% to 30% of nitrocellulose, from 39% to 48% of polyhydric alcohol, polybasic acid, unsaturated fatty acid, and resin, from 13% to 18% of plasticizing material, and from 15% to 20% of castor oil.

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