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DECALCOMANIA PAPER

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This invention relates to decalcomanias and to decalcomania papers. That is, to papers especially prepared for the printing thereon of decalcomania designs.

Such a paper usually comprises a backing sheet which is highly pervious to the passage of water, with one or more layers or coatings of specially prepared adhesive thereon normally dry and adapted to take decalcomania printing, but capable of dissolving rapidly in water in order to release the decalcomania print when that operation is desirable.

An important use of decalcomania is in the application of stamps, labels, and the like, to various articles of merchandise. In making these applications to such articles as grapefruit, oranges, apples, lacquered surfaces, Bakelite and other goods moulded from plastics, and some plated metals, the nature of the surfaces are such that the common water soluble decalcomania coatings do not stick permanently to them. In many of these cases the initial adhesion appears to be secure, but the decalcomania print peels off after a time.

It is the chief object of the present invention to overcome this difficulty while still retaining the advantages of the common forms of decalcomanias.

An attempt to analyze the surface characteristics of these articles to which the adhesion of labels and decalcomania prints is not satisfactory, discloses very clearly that in some cases the trouble is due to a skin film of an oily or waxy nature. This is true, for example, in fruits such as those above mentioned. The extreme density of other surfaces, particularly those of plated and lacquered metals and Bakelite, appears to be responsible for the poor adhesion, while in still other cases the exact reasons for failure seems to defy analysis. We have found, however, that if the gum coat of decalcomania papers of the common commercial forms is replaced with such adhesive coatings as those described below, a permanent union of the stamp, label or print can be made to surfaces of the nature above referred to. In some cases, also, as good, or better, results are produced by applying a coating of one of these adhesive compositions on top of the gum coat.

In general, these coatings comprise a good water-soluble adhesive and a water-insoluble permanently tacky constituent blended together, usually with one or more additional ingredients designed to give the composition the smoothness and spreading qualities required for machine application or to produce the desired degree of adhesion. In addition, it is important that the final coating shall take decalcomania printing readily and that it shall be capable of being so dried out that it will not become sticky while it is being shipped, stored, and during printing, notwithstanding normal atmospheric humidities and temperatures.

A typical formula for this decalcomania coat consists of

	Parts
Hydroresin	80
Alcohol	80
Igepon T	4
Bone glue	20

The last two constituents are dissolved in 250 parts of water heated to moderate temperatures, say 70° C., the hydroresin is dissolved in the alcohol, and then these two solutions are mixed thoroughly together.

In this formula the chief adhesive agent is the glue. Preferably a good grade of a glue of animal origin, such as bone, hide, fish, or animal glue, or mixtures of the same, should be used, all such glues being hereinafter included in the term "animal glue."

The Hydroresin, or some equivalent material, also is an essential constituent and forms the water-insoluble ingredient above mentioned. This is a common commercial form of trihydroxylethylamine abietate. It is of a resinous, pitchy nature and has the property of blending with the glue and maintaining the adhesive coating in a sticky condition after being wet out with water during the releasing operation. In some measure this characteristic is due to its ability to hold water and to refuse to give it up except under unusual conditions, acting in this respect like a balsam or sticky pitch.

Igepon is an emulsifying, blending and wetting agent. It is the chemical name for a compound, the formula for which is understood to be

$$C_{17}H_{33}CONHC_2H_4SO_3Na$$

Other wetting agents may be substituted for it.

A coating of the foregoing composition, after being dried, remains non-tacky, is very resistant to the solubilizing action of water, but is readily softened and rendered tacky by any such application of water as that to which it is subjected during the releasing operation.

In making a decalcomania paper according to this invention, the usual procedure can, in general, be followed. For example, a suitable backing sheet, usually consisting of a water-leaf paper,

is first coated with a starch solution. This coating is dried and it then acts as a sizing to prevent the penetration of the next layer or coat into the backing sheet. Thereafter the adhesive coating made in accordance with the formula above described is applied, is allowed to dry, and, if desired, is then calendered. Or, a dextrine coat may be applied over the starch coat in the usual manner, and after it has been dried, the adhesive coating material is applied, dried, and calendered. Subsequently the web of coated stock is cut up into sheets of the size required for use by the decalcomania printers.

The Hydroresin above referred to may be replaced with other suitable compounds which have the characteristic of remaining tacky or sticky. For example, combinations of rosin and castor oil have this characteristic. A formula which has proved satisfactory, and which includes such a combination, comprises

	Parts
Rosin	12
Castor oil	3
Concentrated rubber latex	4
Bone glue	5½
Strong ammonia	6
Water	70

In this, and in all of the formulae herein given, the parts are by weight. The rosin and castor oil are melted together, the glue is dissolved in the ammonia and water, it is then mixed with the rosin and oil, and the concentrated rubber latex is finally added.

Various compounds of a rubbery nature also are suitable for this purpose. In fact, compositions of the nature used as adhesive coatings in the manufacture of surgical adhesive tape can be used satisfactorily. As a rule they comprise rubber with some filler, such as zinc oxide or lithopone, and sometimes rosin, the whole mixture being dispersed in some solvent, such as naphtha.

A simpler coating material consisting of rubber milled with cumar resin and zinc oxide, applied by means of a suitable solvent, such as naphtha, also can be used.

In general, it may be stated that the rosin and oil combination works particularly well on top of the starch coat, while the others work somewhat better on the gum or dextrine coat.

The decalcomania printing may be done directly on the outer adhesive coating. These decalcomania inks are usually in the nature of a paint and they stick well to coatings of the native above described, the latter being resistant to the solvents used in such inks. However, a lacquer coat can be applied to the surface of the composition coat, if desired, and the decalcomania printing can then be performed on this lacquer coat in a manner well known and commonly practiced in this art.

The outer adhesive coatings can readily be dried out so that they are sufficiently hard to remain non-tacky during the usual handling, shipping and storage. They do not cake up during storage and do not require interleaving.

In applying these decalcomania prints to the work, the usual process may be followed. Ordinarily this consists simply in dipping the decalcomania sheet in water, removing it immediately, and then allowing the sheet to set for twenty seconds, or more, at which time the decalcomania print with its supporting adhesive coat can readily be slid off the backing. When wet in this way the water resistant coating again becomes tacky and will adhere firmly to surfaces, such as those above mentioned, simply by being pressed against them. This is true whether or not the coating has been applied over the dextrine or the starch coat. The dextrine coat is of assistance in effecting the release of the print with its underlying coat of tacky adhesive for the same reasons that it assists the release in the ordinary use of decalcomanias. However, for many purposes it is not necessary to use it since the starch undercoat usually affords a sufficient release for the outer adhesive coat.

When the later adhesive is applied on top of the gum or dextrine coat, some of the gum naturally adheres to it after release. If, however, it takes the place of the gum coat, then there is practically no adhesion of starch to the outer coat, and the attachment of the decalcomania print to the work is accomplished solely by the said outer adhesive coat. This adhesive coating is pressure sensitive so that the adhesion is readily effected. In the former case, however, there is a certain miscibility of the gum coat with the contacting outer layer of adhesive so that the latter primarily forms the medium which secures the print to the work. We have found that such a coating will secure the print in place indefinitely.

Thus the invention provides a decalcomania paper, through the use of which decalcomania prints, labels, or the like, can be affixed to those surfaces to which the ordinary decalcomanias do not adhere firmly, and such application can be made with the assurance that the adhesion will be as secure as in using the ordinary decalcomanias for the customary purposes. The prints or labels are not loosened by changes in atmospheric humidity.

Having thus described our invention, what we desire to claim as new is:

1. A decalcomania paper comprising a water-pervious backing sheet and a coating of a normally dry, non-tacky adhesive united to the surface of said sheet by a union readily releasable by water, said coating being readily softened by water and rendered tacky thereby but containing a substantial proportion of an adhesive strongly resistant to the solubilizing action of water.

2. A decalcomania paper comprising a water-pervious backing sheet and a coating of a normally dry, non-tacky adhesive united to the surface of said sheet by a union readily releasable by water, said coating containing a water-insoluble adhesive and a sufficient proportion of a water-soluble constituent to cause the coating to become sticky during the water release of said coating.

3. A decalcomania paper comprising a water-pervious backing sheet and a coating of a normally dry, non-tacky adhesive united to the surface of said sheet by a union readily releasable by water, said coating containing a water-insoluble adhesive blended with a water-soluble adhesive, said coating having the characteristic of becoming sticky quickly during said water releasing operation and retaining its adhesiveness indefinitely after being so released and applied to the work.

4. A decalcomania paper comprising a water-pervious backing sheet, a coating of water-soluble adhesive on the surface of said sheet, a second coating of a normally dry non-tacky adhesive

united to said sheet by said first coating, the second coating being adapted to take decalcomania printing and being readily softened and rendered tacky by the application of water to said decalcomania paper for the purpose of releasing the decalcomania print, said second coating containing a substantial proportion of a tacky constituent of a resinous nature.

5. A decalcomania paper comprising a water-pervious backing sheet and a coating of a normally dry, non-tacky adhesive united to the surface of said sheet by a union readily releasable by water, said coating being adapted to take decalcomania printing and containing substantial proportions of water-soluble and water-insoluble adhesives and a wetting agent.

6. A decalcomania paper comprising a water-pervious backing sheet, a coating of water-soluble adhesive on the surface of said sheet, a second coating of a normally dry non-tacky adhesive united to said sheet by said first coating, the second coating being adapted to take decalcomania printing and being readily softened and rendered tacky by the application of water to said decalcomania paper for the purpose of releasing the decalcomania print, said second coating containing a substantial percentage of a rubbery constituent.

7. A decalcomania paper comprising a water-pervious backing sheet, a coating of water-soluble adhesive on the surface of said sheet, a second coating of a normally dry non-tacky adhesive united to said sheet by said first coating, the second coating being adapted to take decalcomania printing and being readily softened and rendered tacky by the application of water to said decalcomania paper for the purpose of releasing the decalcomania print, said second coating containing rosin and an oil combined therewith and forming a sticky product.

8. A decalcomania paper comprising a water-pervious backing sheet, a water-absorbent sizing layer on the surface of said sheet, and a coating of normally dry and non-tacky adhesive on said layer adapted to be rendered sticky by the water release of said coating, said coating containing substantial proportions of an animal glue and of a normally tacky adhesive which is strongly resistant to the solubilizing action of the water.

9. A decalcomania comprising a water-pervious backing sheet, a coating of a normally dry non-tacky adhesive on one face of said sheet, said coating being adapted to be rendered sticky by the water release of said coating and being adhesively united to said backing sheet by a water releasable union, and a decalcomania print on said coating, said coating being highly resistant to the common solvents used in decalcomania printing inks, and containing a substantial proportion of an adhesive strongly resistant to the solubilizing action of water.

10. A decalcomania paper comprising a water-pervious backing sheet and a coating of a normally dry, non-tacky adhesive united to the surface of said sheet by a union readily releasable by water, said coating containing substantial proportions of a wetting agent and a tacky adhesive constituent which is strongly resistant to the solubilizing action of water,

11. A decalcomania paper comprising a water-pervious backing sheet and a coating of a normally dry, non-tacky adhesive united to the surface of said sheet by a union readily releasable by water, said coating being adapted to take decalcomania printing and containing substantial proportions of a water-soluble adhesive and Hydroresin.

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