United States Patent

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[54] **DECORATED DETERGENT-RESISTANT PAPER FURNITURE AND COATING SYSTEM THEREFOR**
8 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **297/440,** 108/112, 117/76, 297/442
[51] **Int. Cl.** **A47c 9/12,** A47c 4/02
[50] **Field of Search** 297/440, 442, 443, 445; 229/16, 112; 108/115; 117/12, 76

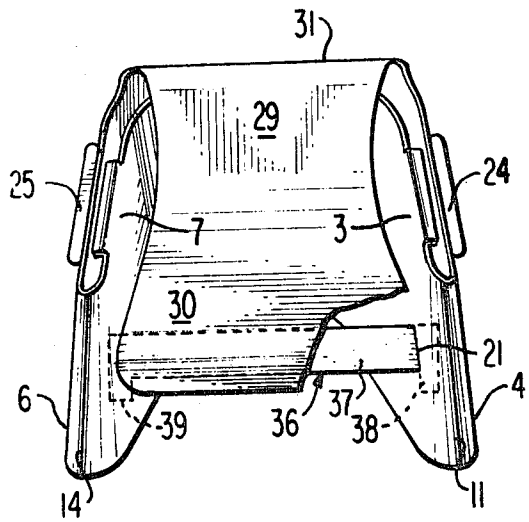
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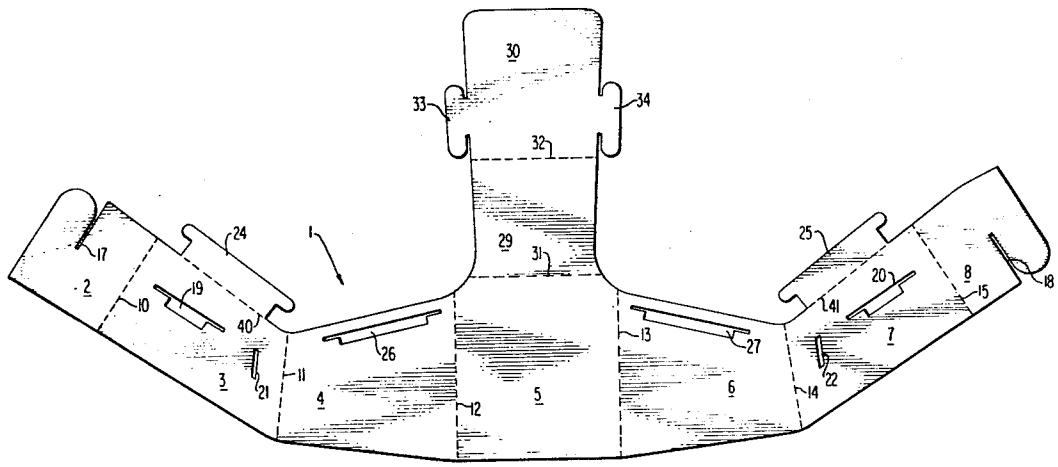
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ABSTRACT: A chair is formed from a single blank of paper stock material coated with a decorative and detergent-resistant coating. The blank comprises panels separated by score lines. The panels, when folded along the score lines, form sides and each side comprises spaced outer and inner panels interlocked by cooperating slots and tabs, the tabs also serving as arm rests. The blank further provides end panels which overlay the panel forming the back of the assembled chair. A seat panel is secured to the top of the back panel by another panel which folds over the back panel and brings the seat panel to its proper position between the inner side panels. The seat panel is secured to the inner side panels by slots and tabs. A rail member extends between the inner side panels and further supports the seat. The coatings can be applied to any paper furniture. The coating is formed of elastic, mar-resistant paint layers which are based upon elastic polyester, elastic polyester polyurethane, elastic epoxy ester and elastic silicone resins for the intermediate and top layers. These resin materials have outstanding color retention and weather resistance and can be rubber or polished to a glossy finish to match the best grades of lacquers which are commercially available.





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SHEET 1 OF 2

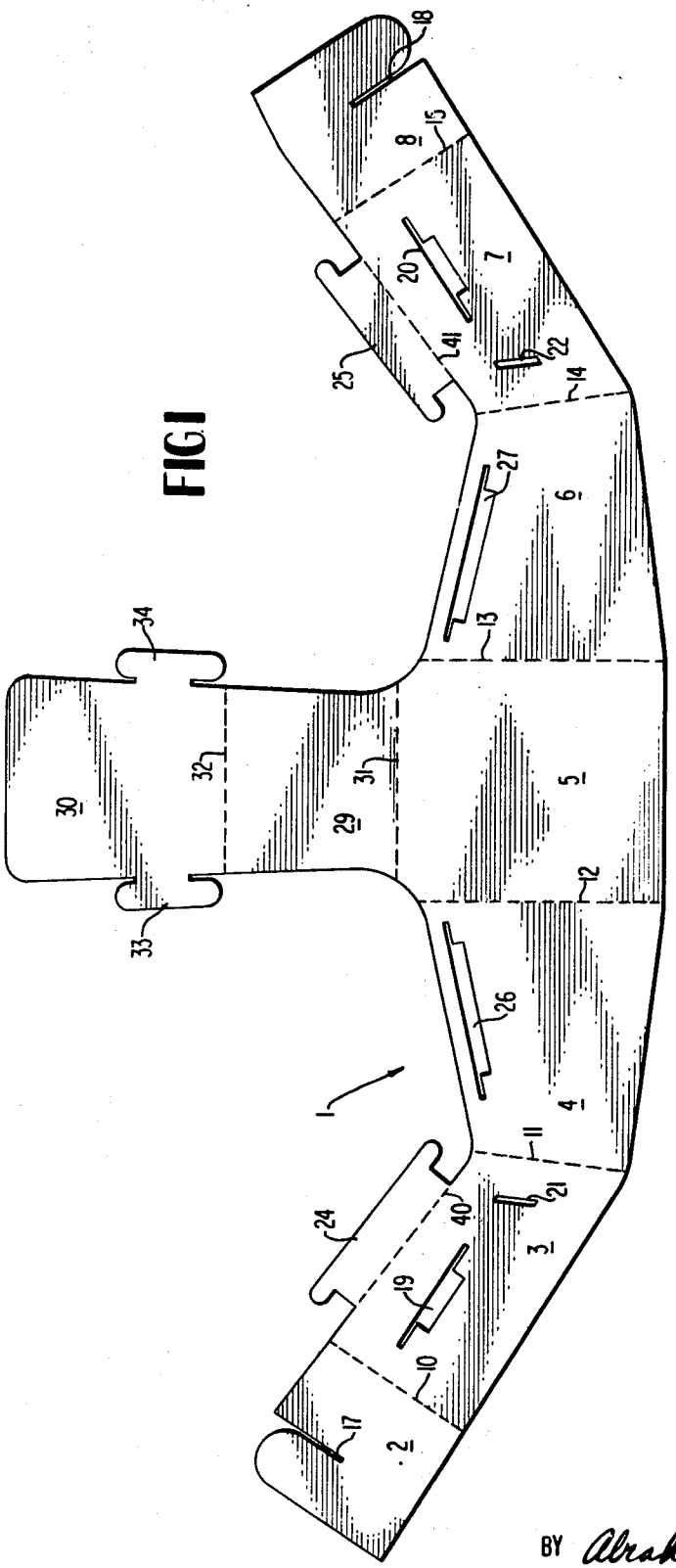


FIG1

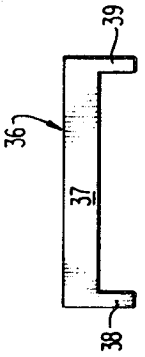


FIG2

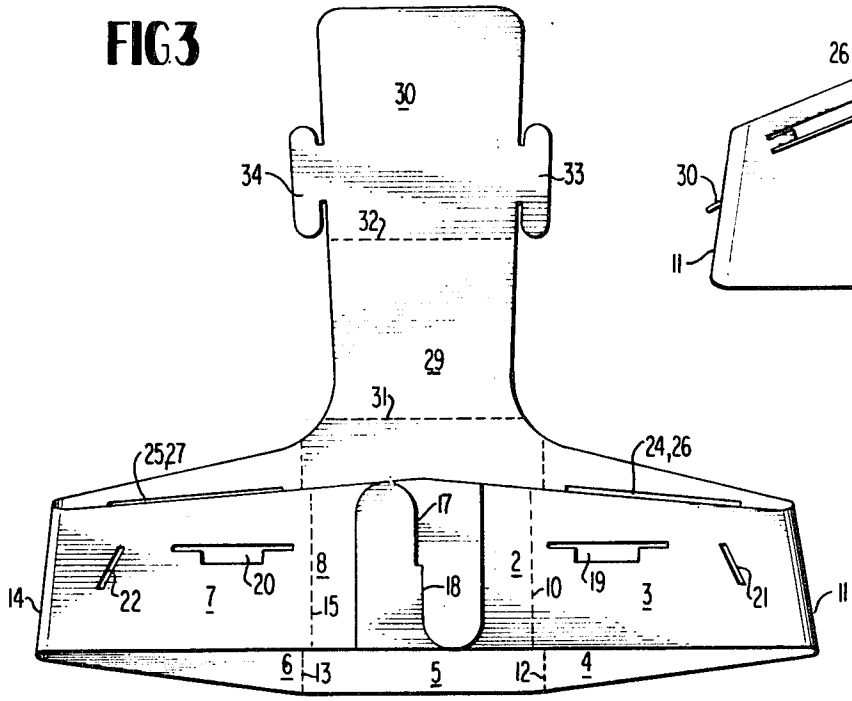
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FIG.3



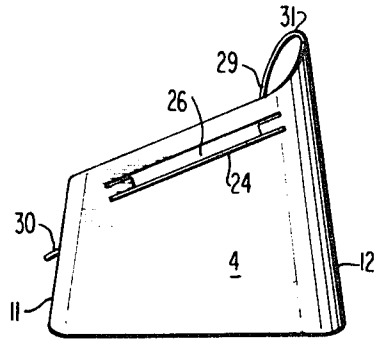


FIG.6

FIG.4

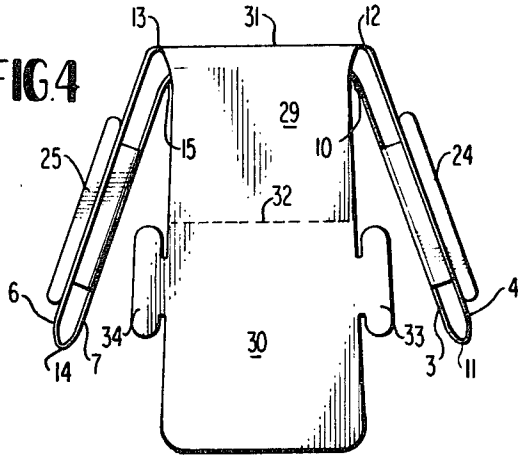
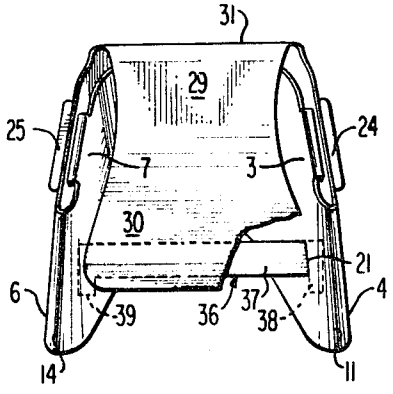


FIG.5



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DECORATED DETERGENT-RESISTANT PAPER FURNITURE AND COATING SYSTEM THEREFOR

This invention relates to furniture, and more particularly to a chair structure formed from a single coated blank of paper stock or like material.

An object of this invention is to provide a single, coated, precut and prescored blank of material, such as fiberboard, pressboard, or like foldable material, which can be folded into an article of furniture such as a chair.

Another object is to coat the blank with a decorative, detergent-resistant coating to enhance the appearance of the piece of furniture formed from the blank and also to provide a protective coating therefor which can be cleaned with any of the common detergents or other types of cleaners.

A further object is to provide a decorative and detergent-resistant coating for a blank to be folded into an article of furniture, which coating is of sufficient resiliency and flexibility so that it adheres to the blank stock without breaking or cracking as the blank is folded and otherwise manipulated to form the piece of furniture.

Another object is to provide a coating for paper furniture which is mar-resistant, elastic, has outstanding qualities of color retention and weather resistance and which can be rubbed or polished to a glossy finish to match a lacquer finish.

A further object is to provide weather-resistant outdoor painted paper furniture in a variety of colors which withstand outdoor exposure to sunlight without fading or yellowing.

Another object is to provide a method for preparing mar-resistant coated furniture from a single paper blank and special elastic coating materials which are adapted for outdoor and indoor use.

Further objects and advantages will be apparent from the following description and accompanying drawing, wherein:

FIG. 1 is a plan view of the blank which is precut and scored to be folded into a chair;

FIG. 2 is a plan of the rail which supports the front end of the seat;

FIG. 3 is a plan view illustrating the infolding and interlock of the side panels;

FIG. 4 is a perspective view of the partly folded blank and illustrates the folding of the back and seat portions relative to the side portion;

FIG. 5 is a front perspective view of the assembled chair; and,

FIG. 6 is a side perspective view of the assembled chair.

FIG. 1 discloses the blank in flat condition. By folding the blank as described herebelow, a chair is formed without the use of any fastening means such as staples and adhesive, the chair being of sufficient rigidity to support an adult. The blank may be made of any foldable materials which has the required rigidity. Preferably, the material is corrugated fiberboard which is light in weight, has the desired rigidity, and which can be easily coated with a decorative coating which is detergent-resistant so that the chair may be cleaned when necessary.

In view of the necessity of folding the blank to provide the sides, back and seat, the coating must be of sufficient elasticity and resiliency so that it slightly yields without breaking or cracking.

The yielding coating cannot peel away from the paperboard, fiberboard or corrugated board material, yet it must be heavy enough to completely change the characteristics of appearance and feel of the paper furniture to which it is applied. The coating must withstand a full 180° bend and cannot sustain any macroscopic cracking marks or fissures as a result of such bending. The coating must resist alcohol spotting, water spotting, fading by strong sunlight and burning by cigarettes. It must be easy to clean and resistant to chalking if strong cleaning materials are employed.

It is preferred that the blank be cut before it is coated and it is preferred that the coating be effected by dipping rather than by spraying since the former operation requires less personnel and the thickness of the coating may be more accurately adjusted to provide a more uniform product. It is preferred to utilize the novel coating method applied to paperboard materials at low temperatures, e.g. not more than 150° C. or 300° F., and it is also desirable to apply strongly adherent sealing coatings, such as polyurethanes based upon the reaction products of polyisocyanates with flexible polyesters, polyethers, polyester amides or with acrylic resins containing free carboxylic acid groups or with vinyl resins containing free carboxylic acid groups. These primers completely alter the characteristics of the paperboard material to permit heat curing of the intermediate or top coatings without tenderizing or damaging the paperboard base material.

In serial order starting from the left in FIG. 1, blank 1 comprises the following panels: end panel 2, inner side panel 3, outer side panel 4, back panel 5, outer side panel 6, inner side panel 7 and end panel 8. Each of the above panels is hinged to its adjacent panels by score lines 10, 11, 12, 13, 14 and 15, respectively. Each score line is formed by a scoring tool and is of sufficient width to permit the blank stock to form a generally rounded fold, rather than a sharp fold. The rounded fold permits the coating to adhere to the stock material whereas a sharp fold would tend to break or crack the coating. As will be pointed out hereafter, the rounded folds are illustrated in FIGS. 4, 5 and 6.

End panels 2 and 8 have oppositely extending slots 17 and 18 cut therein. Inner side panels 3 and 7 have T-shaped slots 19 and 20 and rectangular slots 21 and 22 cut therein. A T-shaped tab 24 extends from the top of panel 3 and a similar tab 25 extends from the top of panel 7. Outer side panels 4 and 6 have T-shaped slots 26 and 27 cut therein, which in chair-assembled position interlock with tabs 24 and 25 respectively.

A panel 29 extends from the top of back panel 5, and a seat panel 30 extends from panel 29. Score line 31 hinges panel 29 to panel 5 and score line 32 hinges seat panel 30 to panel 29. Tabs 33 and 34 extend from the sides of seat 30 to interlock with slots 19 and 20, respectively.

The only additional part used to form the chair is the seat rail 35 illustrated in FIG. 2. It comprises a rail portion 37 and legs 38 and 39 which interlock with slots 21 and 22, respectively.

Tabs 24 and 25 have score lines 40 and 41, respectively, at their junction with their respective panels, whereby the tabs may be folded normal to the faces of the panels.

After the blank is cut, slotted, and score lined to provide the above panels, slots and tabs, it is coated with the desired coating to provide the required properties outlined above. Application of the coating to the blank may be carried out by the available apparatus and processes, such as by rolling on the coating, or by dipping the blank. Dipping is preferred because such method assures the application of the coating to all surfaces of the blank, including the surfaces of the edges of the blank and the surfaces within the several slots.

To form the chair from the blank, the ends of the blank containing panels 2, 3, 7 and 8 are folded along score lines 11 and 14, and the end panels are interlocked by interengageed slits 17 and 18, as illustrated in FIG. 3. Tabs 24 and 25 are bent to interlock with slots 26 and 27, respectively, either before slits 17 and 18 are interengaged or thereafter.

As will be noted from FIGS. 3 and 4, score lines 10 and 12 are generally aligned. The same is true of score lines 13 and 15. Inner side panels 3 and 7 overlay outer side panels 4 and 6, respectively.

The next step in forming the chair involves folding interlocked side panels 3–4 and 6–7 toward each other along aligned score lines 10–12 and 13–15, respectively, as illustrated in FIG. 4. Panel 29 is folded down along score line 31 so that it forms the inner back panel, and panel 30 is folded up along score line 32 generally normal to folded panel 29 to form the seat. Tabs 33 and 34 are interlocked within slots 19 and 20, respectively, and rail 36 is secured to inner side panels 3 and 7 by sliding legs 38 and 39 into slots 21 and 22, respectively. The front of seat 30 is supported on rail member 37 of rail means 36, as illustrated in FIG. 5.

Tabs 24 and 25 are of sufficient size to serve as arm rests, as illustrated in FIG. 5. FIGS. 4 and 5 further illustrate the manner in which the side score lines 11, 14, etc. permit rounded folds whereby inner side panels 3 and 7 are spaced from the outer side panels 4 and 6, respectively, whereby a rigid support for the chair is obtained. The spacing between the inner and outer side panels is maintained by the portions of tabs 33 and 34 and of legs 38 and 39 extending between the inner and outer side panels.

The finally assembled chair is shown in FIGS. 5 and 6. The weight of the user is supported by the double paneled structure of side panels 3–4 and 6–7. All of the corners at which the panels join each other are generally rounded to reduce bending stresses on the coating.

While various types of coatings and methods of their application are available, the coatings and methods described below are illustrative and are preferred for the reasons which are pointed out in the several description of preferred materials and combination in critical thicknesses.

Although the present preferred example of decorated paper furniture is in the form of a chair structure from a single coating blank of paper stock material, it is obvious that the present novel coating and manufacturing concepts are applicable to the manufacture of desks, tables, sofas, chests, etc., which are made from more than a single blank.

Paper furniture has been made before but has not been accepted for use in areas open to view because it has been impossible to disassociate the appearance and serviceability from that of a paper carton or temporary storage chest. The paper furniture made heretofore has not been satisfactory in appearance or serviceability. Under no circumstances has this furniture been usable outdoors.

The present novel decorating system for paper furniture is based upon the need to apply an overall thickness of at least 5 mils of coating in a plurality of layers including a primer coating, a flexible tough mar-resistant intermediate coating and a hard outer surface layer. The combination of primer and elastic top coating prevents cracking at the bent portions.

The coating is formed of elastic, mar-resistanct paint layers which are based upon elastic polyester, elastic polyester polyurethane, elastic epoxy ester and elastic silicone resins for the intermediate and top layers. These resin materials have outstanding color retention and weather resistance and can be rubbed or polished to a glossy finish to match the best grades of lacquers which are commercially available.

The chemical formulation of the plastic vehicle prevents chalking and wearing by abrasives and detergents. This same chemical vehicle selection provides outstanding heat resistance and outstanding resistance to staining from alcohol, coffee, etc.

Synthetic alkyd coatings, acrylic or vinyl latex coatings and cellulose lacquers which have been used for indoor architectural finishes are not satisfactory when applied to paper furniture and cannot achieve the results which are obtained in the present invention. These commercially available household paints, whether water based or oil based, provide a coating of 1–2 mils in thickness after a single roller application or double spraying applications. If the thickness is raised to 5 mils, the paint flakes and cracks away from the base. This tendency to flake and crack is accelerated with time, aging, exposure to sunlight and exposure to moisture. In a relatively short period of time, washing and rubbing of the decorated furniture removes the coating in patches. Stripping and refinishing would not be practical.

Rubber latex paints applied to paperboard are also unsatisfactory since they can be applied only in thin layers which flake away from the base. If plural coatings are applied over a primer, they tend to peel, and peeling often may be of one coat of rubber material away from another coat of the same rubber latex, the latex adhering more tightly to the primer than to itself. Furthermore, the latex coatings cannot be polished to a high gloss when desired and cannot provide high surface hardness, both of which are required attributes of the present invention.

The elastic mar-resistant resinous paint is preferably applied in several thin layers to the paper blank which has been primed with a sealer. One type of elastic coating material which can be used in an elastic polyester resulting from esterification of saturated or unsaturated dicarboxylic acid with polyhydric alcohols which have been reduced with a polymerizable vinyl monomer solvent. This vinyl-polyester coating contains only traces of volatile ingredients and is well known in the art; but it has never before been applied to fiberboard, pressboard or like paperboard materials for paper furniture.

The dicarboxylic acid is preferably derived from phthalic anhydride or isophthalic acid or terephthalic acid, and the halogenated and hydrogenated derivatives of these acids may be used where fire proofing or better solvency are needed. The unsaturated dicarboxylic acids include maleic anhydride, maleic acid, itaconic acid, citraconic acid, mesaconic acid, aconitic acid, etc. Longer chain saturated aliphatic dicarboxylic acids including adipic, pimelic, azelaic, etc. are useful to impart flexibility, while the phthalic acid-type compound imparts toughness. Long chain saturated acids add flexibility (coconut oil fatty acids) and may be used in mixtures.

The polyhydric alcohol may have aromatic nuclei or may be an alkylene alcohol such as diethylene glycol, ethylene glycol, 1–3 3 butylene glycol, dipropylene glycol, etc. Abietyl alcohol is useful.

The vinyl monomers generally used are styrene and vinyl toluene, dibutyl fumarate, diethyl maleate, 2-ethyl hexyl acrylate, diallyl phthalate, diallyl maleate, methyl methacrylate, acrylonitrile, vinyl acetate, triallyl citrate, etc.

There is sufficient unsaturation in the unsaturated polyester to combine with the polymerizable vinyl monomer to convert the liquid polyester system to the cured state after filming and without the need for volatile solvent or volatile hydrocarbon thinner.

A base coating of reactive polyisocyanate polymer in a thickness of about 0.05 to 1.0 mils is applied to the paper to form the primer and thereafter the flexible polyester is applied to produce a flexible intermediate layer about 5–15 mils in thickness. Metal driers, as used in siccative coatings, e.g. cobalt naphthenate, nickel oleate, lead naphthenate, etc. and mixtures, are generally used with organic peroxide to accelerate conversion of the vinyl thinned unsaturated polyester polymers from the liquid to a gel state and then to a solid state. The conversion from a gel to a fully hardened state takes place through interpolymerization of the vinyl monomer solvent and the unsaturated polyester polymer. It may be desirable to dilute the polyester with volatile solvent if the intermediate coating is to be applied by spraying. Such solvents illustratively may be ethyl acetate, butyl acetate, toluene, acetone, methyl ethyl ketone, hi-flash naphtha, turpentine and cyclohexanone.

The preferred primer which promotes adhesion to the polyester top coating is the reactive polyisocyanate made from castor oil and methylene bis-4-phenyl isocyanate. Instead of the castor oil material, ether resin fatty acid esters (epoxy esters) or dimerized fatty acids may be used. To promote air drying, there may be added to the reactive primer 0.5 percent lead and 0.05 percent cobalt as metals based on the weight of the vehicle solids. The castor oil polyisocyanate is preferably sprayed at approximately 35 percent solids in hydrocarbon (xylene) or other suitable solvent while the epoxy esters are generally applied at approximately 35 to 40 percent solids in volatile organic solvent (toluene).

A free radical peroxide catalyst is also present in the intermediate polyester layer. The catalyst is of the oxidation-reduction type. The peroxide is added just before the material is sprayed on. The peroxide used include 60 percent methyl ethyl ketone peroxide in dibutyl phthalate, 50 percent cyclohexanone peroxide in dibutyl phthalate and cumene hydroperoxide. A small percentage, usually about 0.02 percent of cobalt metal in the form of a metal-organic oil soluble

salt, is mixed in the catalyst and resin at the time solvents are added. The amount of peroxide used may vary from 1 to 4 percent and the preferred amount is 0.6 to 1.5 percent for methyl ethyl ketone peroxide which has a short pot life of about one-half hour. For more extended pot life, cumene hydroperoxide may be used in an amount of 1–2 percent.

A clear top layer of reactive polyisocyanate resin is preferably applied over the intermediate polyester layer. This top layer has high gloss, high surface hardness, excellent flow during application and good mar resistance.

The intermediate polyester coating may include a thixotropic filler. One example of such filler is short fiber asbestos of fine standard plastic filler grade. Others include pulverized dehydrated silica gel in an uncompressed state, e.g. "Cab-o-sil," Godfrey L. Cabot Co., "P–D–244 Silica," Davison Chemical Co., or "Santocel," Monsanto Chemical Co., certain natural and/or treated clays which include combined water in their structure (so-called hydrous clays), e.g. bentonite, etc.

The asbestos shorts, silica gel and hydrous clays are employed in small amounts, usually between about 0.5 percent and 5 percent by weight.

The silica gels represented by "Cab-o-sil," "Santocel" and "P–D–A244 Silica" are dry, free-flowing, powdery products which contain small amounts of combined water in their gel structure and are submicroscopic particles having a silica content (dry basis) of 99.0 to 99.7 percent, a free moisture content of 0.2 to 2.0 percent at 105° C. and a negligible content of calcium oxide, magnesium oxide and ferric oxide. Opaline hydrous siliceous minerals, such as hyalite and diatomite, are natural products comparable to the above manufactured products which, in comminuted form, can also be used.

Finely divided solid materials of a hard abrasive nature may be added to impart reinforcement and particularly skid proofing. Thus, pulverized sand, pumice, aluminum carbides, aluminum silicides, garnet, glass, porcelain, blast furnace slag, etc., represent comminuted abrasive materials which can be used.

Another example of a flexible coating is the epoxy ester coating as shown in the air dry enamel vehicle in the Lee and Neville text, "Epoxy Resins," McGraw-Hill Book Co., Inc., 1957, at page 286; but, for the purposes of the present invention, this coating must be applied over paperboard material in a new way and in a thickness of 3–12 mils over an acrylic primer or a vinyl carboxylic acid ester primer, such as VMCH.

This air dry enamel vehicle comprises 43 percent by weight of epoxy resin of molecular weight 1,000, 47 percent by weight of linseed fatty acids and 10 percent by weight of gum rosin. The epoxy resin has a viscosity of Y–Z on the Gardner-Holdt scale at 60 percent solids in mineral spirits. The film may be baked for 30 minutes at 150° C. if there is added 15 percent of melamine formaldehyde resin to 85 percent of epoxy ester. Tall oil acids may be used. The thixotropic fillers, pigments and dryers may be added to the epoxy ester enamel in much the same fashion as to the polyester enamel.

A useful flexible silicone resin is that which is based upon a mixture of polysiloxane and flexible alkyl or flexible polyester resin. The flexible alkyl component is prepared from the reaction of polyhydric alcohol, such as ethylene glycol, diethylene glycol or glycerine, with dicarboxylic acids, such as succinic acid, adipic acid, sebacic acid, isophthalic acid or phthalic acid, the reaction being carried out with an excess of the acid component so that the polyester contains at least two free carboxyl groups for acid functionality in reaction with epoxy ester and silicone resin. Only about 10–30 percent of low molecular weight epoxy resin (preferably of molecular weight 1,000) is required and about 10–30 percent of polysiloxane resin is employed to provide a heat-resistant, solvent-resistant, hard-surfaced thermoset finish.

From 10–25 percent urea or melamine formaldehyde may be added together with an aliphatic amine catalyst (triethylene tetramine) to facilitate heat curing at temperatures of 250° F.

Conventional pigments may be employed. In making the coating mixture, the silicone resin is added at the last step because it serves to improve the flow of the resin when applied by dipping or roller coating. If up to 25 percent of the dibasic acid is substituted with unsaturated acids, such as oleic acid, tall oil acids, linseed oil acids, and a metal drier is added of the type mentioned above for the polyester coating, the coating may be dried in two stages, a first stage of air drying to evaporate volatile solvents used as thinners and a second stage of baking at 250° F. for 30 minutes.

The silicone resin for coating may be purchased from the supplier under "Silicone Resin SR–82" (Dow Corning Chemical Co.). The alkyd resin may also be purchased from commercial sources. The epoxy resin may be purchased from the Shell Chemical Co. under the name of "Epon Resin." The polyester resin may be purchased from Pittsburgh Plate Glass Co. The polyurethane resins based upon polyether prepolymer, polyester prepolymer and polyesteramide prepolymer may be purchased from E.I. DuPont de Nemours Co. or from Mobay Chemical Co.

Although the resins are generally interchangeable, the elastic polyester resins are applied in greater total thickness than the epoxy resins or the epoxy silicone resins, e.g., from about 7–15 mils total thickness contrasted to 4–10 mils total thickness.

The above disclosed embodiment of the invention is for illustrative purposes only, and it will be evident that various changes and modifications may be made therein without departing from the scope and spirit of the invention.

I claim:

1. A single blank of foldable sheet material for forming a chair comprising:

a series of panels which join each other in the following order: an inner side panel, an outer side panel, a back panel, a second outer side panel, a second inner side panel, and end panels;

said second panels being substantially of the same size and shape as the first claimed corresponding panels;

score lines at the junction of said adjacent inner and outer side panels to permit the folding of each inner side panel to overlay its adjacent outer side panel;

interlocking means on said adjacent inner and outer side panels to secure said panels in spaced relation;

score lines between the back panel and each of the outer side panels to permit each of the secured spaced side panels to be positioned to form the sides of the chair;

an inner back panel having an edge hinged by a score line to the top of the back panel;

a seat panel hinged by a score line to the opposite edge of said inner back panel;

said score lines at the edges permitting folding of the inner back panel and attached seat panel between the side panels to bring the seat panel into a horizontal position;

said end panels being hinged by a score line to the outer edge of each inner side panel, said end panels being carried by their respective adjacent inner side panels, when the latter are folded to overlay their respective outer side panels, to a position wherein each end panel overlays a portion of said back panel and the end panel score lines align with the score lines between the back panel and the adjacent outer side panels, to thereby permit the folding of the spaced side panels to their final assembled position; and,

means for securing said seat panel to said inner side panels to thereby form a complete chair from the blank.

2. The blank for forming a chair as defined in claim 1 wherein each end panel has an oppositely extending slit which interengages to lock said end panels in the position wherein they overlay the back panel.

3. The blank for forming a chair as defined in claim 2 wherein the interlocking means securing the inner and outer side panels comprise mutually interlocking tab and slot means, and wherein the means for securing the seat panel to the inner side panels comprise mutually interlocking tab and slot means.

4. The blank for forming a chair as defined in claim 3 wherein a rail means is provided to support the front of the seat panel, said rail means extending into slots formed in the inner side panels.

5. The blank for forming a chair as claimed in claim 4 wherein the spacing between each inner and outer side panel is maintained by the tab and slot means securing the seat panel to the inner side panels and by the ends of the rail means extending through their cooperating slot means.

6. The blank for forming a chair as defined in claim 3 wherein the first claimed tab and slot means bridge the spacing between the inner and outer side panels to form arm rests.

7. The blank for forming a chair as defined in claim 1 wherein the blank is coated with a decorative elastic and detergent-resistant coating which comprises a plurality of layers consisting of a primer coating and an elastic layer over the primer coating, the primer coating being in a thickness of up to about 1 mil and the elastic layer being at least 4 mils thick, and wherein said elastic layer if formed of a resin which provides a hard, mar-resistant, burn-resistant and stain-resistant surface and is selected from the group consisting of elastic polyester, elastic polyester polyurethane, elastic polyether polyurethane, elastic polyester amide polyurethane, elastic epoxy ester modified with aminoplast resin and alkyd resin, and elastic epoxy ester modified with acrylic resin.

8. A blank as defined in claim 7 wherein the elastic layer above the primer coating is composed of an intermediate layer and a top layer, the intermediate layer being more flexible than the top layer and containing a thickening agent, and wherein the top layer provides a hard, unpigmented surface which can be rubbed to a high gloss.