Sept. 16, 1941. C. BATCHELLER 2,256,272

METHOD OF MAKING COMPOSITE PANEL ELEMENTS

Filed Nov. 28, 1938

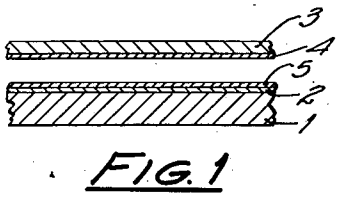

FIG. 1

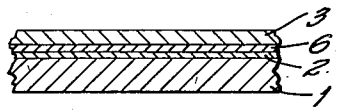

FIG. 2

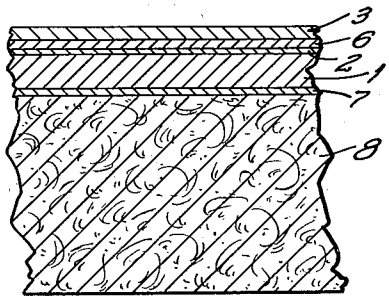

FIG. 3

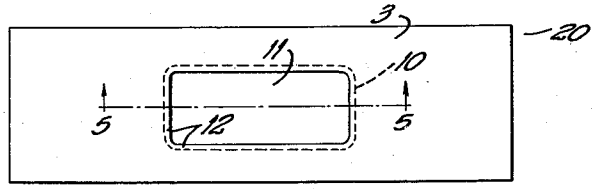

FIG. 4

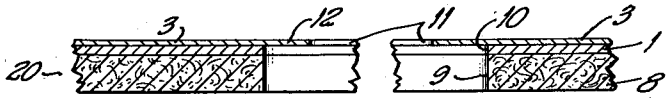

FIG. 5

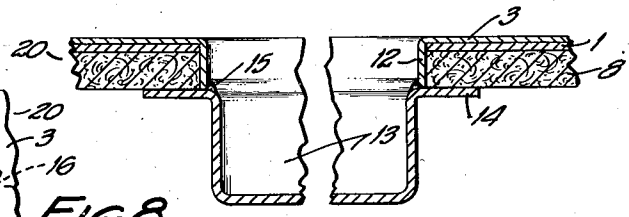

FIG. 6

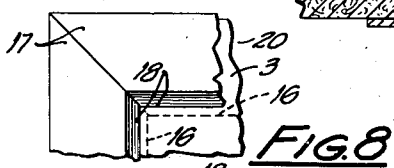

FIG. 8

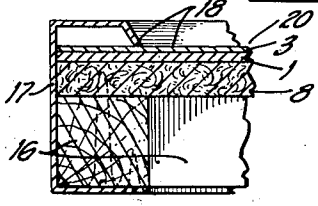

FIG. 7

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METHOD OF MAKING COMPOSITE PANEL ELEMENTS

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Application November 28, 1938, Serial No. 242,676

2 Claims. (Cl. 29—188)

My invention generally relates to composite products which are particularly adapted for use in forming table tops and similar articles and my invention also relates to a novel method of forming such composite structures.

By the term "table tops" I intend to include table and cabinet tops, cabinet panels, table tops for sinks and like structures.

Heretofore, table tops have in some instances been formed of comparatively heavy gauge sheets of corrosion resistant metal such as corrosion resistant, alloy steel, Monel metal and like metals, but the use of these metals for such purposes has been quite limited due mainly to the fact that the metal sheets must be comparatively thick in order to provide adequate structural strength with a minimum of buckling or distortion, thereby rendering the cost of these sheets, so far as the cost of metal is concerned, very high. When such sheets are used as table tops in sink units, the comparatively heavy gauge metals are deep-stamped to provide a depressed sink or bowl, surrounded by a substantially flat plate surface which serves as a table top. Such metal units are objectionable because of the sharp metallic note or ring which is produced when struck and it has been practically impossible to eliminate this ring.

It should also be observed that the high cost of sink units of the above character is not due entirely to the cost of the metal alone but also depends upon die costs and labor entailed in forming the sinks; and losses are also encountered because of defective products.

Sheet metal of about a 20 to 24 gauge thickness ordinarily is employed in fabricating table tops such as those used in sinks, cabinets and the like, and corrosion resistant, alloy steel sheets of this thickness, although admirably suited for the purpose, are of greater weight per unit of area than, for example, sheets of ordinary carbon steel of like thickness, its cost is considerably greater and it may be quite easily dented or otherwise distorted when subjected to an impact force.

My invention, broadly speaking, contemplates the provision of a composite, laminated sheet product comprising a facing element of relatively thin, corrosion resistant metal such as corrosion resistant, alloy steel and a backing element of ordinary carbon steel, said elements being securely bonded together by means of solder to form a composite product which is admirably suited for use in forming table tops and which is of sufficient structural strength and integrity to meet the requirements of the purposes for which it is intended. Such a composite product is lighter in weight than a sheet of corrosion resistant, alloy steel of like thickness and has a greater surface hardness. My invention also contemplates a composite product comprising the bonded elements, above noted, and a hard molded product which is bonded to said metal elements with the carbon steel sheet as a core element. A molded sheet product of the preferred type, hereinafter pointed out, forms a durable and strong reinforcing element for my composite product and renders it very desirable for use in the fabrication of table tops because it will not warp or buckle when subjected to moisture. This latter product is also sufficiently strong to withstand the forces to which table tops are ordinarily subjected and the undesirable metallic ring is absent.

More particularly, a first object of my invention lies in providing a composite sheet or panel product comprising a facing, sheet element of corrosion resistant metal, preferably a corrosion resistant alloy steel, and a backing element of an ordinary carbon steel sheet, said sheets being firmly bonded together by solder. Another object of my invention resides in providing a composite sheet product comprising the metal sheet elements, bonded together as above indicated, and a hard, molded sheet product secured to said metal sheets with the carbon steel sheet as a core element. These composite products are particularly adapted for use in the fabrication of table tops and the products are particularly characterized, among others of their properties, by the fact that the corrosion resistant surface thereof may not be dented or distorted as readily as a sheet of corrosion resistant, alloy steel of the gauge ordinarily employed for such purposes.

Other objects of my invention reside in the provision of a table top, comprising a structure of the foregoing character which is particularly designed for use in forming sink units, and the methods of forming table tops, hereinafter more particularly pointed out; and, with these and other objects in view, my invention includes the novel constructions and those steps in the method of forming the constructions described below and illustrated in the accompanying drawing, in which—

Fig. 1 is a greatly enlarged, fragmentary, sectional view of two metal sheet elements with their surfaces prepared for bonding purposes;

Fig. 2 is a view similar to Fig. 1 but illustrating the two metal sheets bonded together;

Fig. 3 is a greatly enlarged, fragmentary, sectional view of a composite sheet product comprising the elements of Figs. 1 and 2;

Fig. 4 is a plan view of a table top;

Fig. 5 is an enlarged, fragmentary, sectional view of the table top of Fig. 4 taken in about the plane 5—5 thereof;

Fig. 6 is a view similar to Fig. 5 but showing the finished table top construction and a sink associated therewith;

Fig. 7 is an enlarged, fragmentary, sectional elevation view of a marginal portion of a table top illustrating one manner in which a molding strip may be applied thereto; and

Fig. 8 is a fragmentary plan view of the details shown in Fig. 7.

Corrosion resistant, alloy steel sheets may be produced, under cold rolling processes, in strip form in thicknesses of the order of about 0.004" to about 0.011", in widths of about 27" or 28" and in lengths of 500 feet and greater. These strips or sheets, for many purposes, are quite lacking in structural strength, and their extreme lightness in weight per unit of area, their lustrous surface appearance and enduring qualities would render them very desirable for many purposes were it not for the fact that they are of insufficient structural strength for such uses.

Sheets of corrosion resistant, alloy steels, preferably those coming within the ranges of so-called "stainless" steels, and of a thickness of the order above indicated, however, when composited or bonded to a comparatively heavy gauge sheet of carbon steel, are particularly adapted for use in fabricating table tops.

I have found that a very desirable manner in which to composite these two metal sheets together and effect an extremely strong bond therebetween lies in securing said sheets together by means of solder. The bonded product is quite durable when used for the purposes herein comtemplated and the sheets will remain bonded together for substantially an indefinite period of time. Before soldering the sheets together, I prefer first to galvanize one surface of the carbon steel sheet 1 as indicated at 2. Thereafter, the galvanized surface may be treated to render it roughened or rugose whereby to aid to a considerable extent in effecting a strong solder-bond between the carbon steel sheet and the thin sheet 3 of alloy steel.

To roughen the galvanized surface, it may be subjected, for example, to a sand blast or pickled in sulphuric acid or other means may be used to provide a desired roughness. A surface of the alloy steel sheet may also be roughened and the roughened surfaces of both sheets are preferably tinned by employing any common method of applying tin as in the manufacture of tin plate. Hence, as illustrated in Fig. 1, one surface of the alloy steel sheet is provided with a layer of solder 4 and the galvanized surface 2 of the carbon steel sheet is likewise provided with a layer of solder 5.

The metal sheets may be placed in superposed relation in a hydraulic, hot-plate press with their tinned surfaces together and subjected to pressure of suitable magnitude under a temperature substantially equal to that of the melting point of the solder used which, preferably, has a low melting point. For example, I have found that a solder of the following composition and percentages by weight serves as a very good bonding medium. Such a solder may comprise about 92% tin, 5% antimony and 3% bismuth and has a comparatively low melting point.

Under heat and pressure in the hot plate press, the soldered layers 4 and 5 coalesce and form the layer of solder 6 illustrated in Fig. 2, which serves to effect a strong bond between the two metal sheets. In practice, when coalescence of the soldered layers has occurred, the temperature is permitted to drop while the pressure is maintained until a firmly bonded, composite product is attained.

Such a metal, laminated product may well be employed in making table tops because the two metal sheets are bonded together over substantially their entire areas and the bonding medium is permanent and will not deteriorate with time nor does the strength of the bond effected thereby become less with age as in the case of adhesives. Furthermore, the bond is not impaired by moisture and it serves effectively to prevent corrosive attack on or oxidation of the carbon steel core.

In order to provide a composite product which, in its entirety, may form a table top of requisite structural strength, I prefer to bond the composited metal sheets, above described, to a hard, molded sheet product with the carbon steel sheet as a core element. Such a composite product is illustrated in Fig. 3, wherein the metal sheets are shown bonded by means of a suitable adhesive 7, hereinafter more fully described, to a molded sheet product 8.

The molded sheet product which I prefer to use is an asbestos fiber board or panel which comprises principally asbestos fibers and a cementing agent and which product is characterized principally by the fact that it will not warp, buckle, or be otherwise distorted when subjected to moisture. For example, the molded sheet product may comprise the following:

Short asbestos fibres (waste fibres)	lbs.	200
Calcined magnesite (200 mesh)	lbs.	40
Bentonite (colloidal clay, 200 mesh)	lbs.	12
Water to plasticize	gals.	20

A typical formula of another and preferred example of a suitable, molded sheet product is as follows:

	Pounds
Portland cement	365
Asbestos fibres	665
Bentonite (colloidal clay, 200 mesh)	50
Calcined magnesite	25

Water for workability.

Molded products of the foregoing formulae have great strength and toughness and, even when very thin, show no tendency to warp or buckle when wet. Furthermore, they may be molded to provide a smooth surface and they may be easily worked as by sawing, grinding, drilling and like operations.

Products other than those of the above type may be employed in making my composite product but a board or sheet of the character pointed out is extremely desirable because of its physical properties which render it of particular value in the fabrication of table tops.

The molded sheet 8 is preferably of a thickness of between one-quarter of an inch and three-eighths of an inch, while the galvanized carbon sheet may be of a 24 to 26 gauge thickness and the alloy steel sheet is preferably of a thickness of about 0.009" to about 0.011". A

composite product of this character is extremely well suited for use in forming table tops because of its lightness in weight, durability, structural strength and resistance to denting or deformation due either to impact or to the presence of moisture. It is also of comparatively low cost and there is an absence of any metallic sound or ring when struck.

Asbestos sheet or board products of the foregoing character are ordinarily produced in a plastic, formative stage as "sheet-mats" and placed upon fairly heavy gauge, steel press plates having smooth oil-film lubricated surfaces. A plurality of these press plates with their respective plastic mats are stacked one upon the other and, under pressure, are allowed to remain in the stack until sufficiently hydrated to permit stripping thereof from the press plates. These sheets may be molded to desired size and of a surface area conforming to the desired area of the table top or composite product in which it is to be used but, of course, the sheet may be molded slightly oversized and trimmed to desired dimensions.

As illustrated in the drawing, the metal sheets 1 and 3 and the molded product are preferably preformed to substantially the same dimensions and surface areas and thereafter the metal sheets are soldered together and subsequently bonded to the molded product. In the embodiment illustrated, wherein I have shown a table top, indicated generally at 20, which is designed for use in a sink unit, the molded product 8 and the carbon steel sheet 1 are provided respectively with an opening 9 and 10 which substantially conform in shape and size and are adapted, in the finished, composite product, to lie substantially in registry. The corrosion resistant sheet 3 is also preformed with an opening 11 which substantially conforms in shape to the openings 9 and 10 in the other sheets but is slightly smaller in size to provide, when the metal sheets 1 and 3 are bonded together and thereafter bonded to the molded sheet 8, a flange 12 which extends entirely about and above the openings 9 and 10 and projects inwardly from the sides thereof (see Figs. 4 and 5). After the sheets are bonded together, the flange 12 is depressed, as illustrated in Fig. 6 to cover the walls of the openings 9 and 10 and preferably to lie thereagainst. Furthermore, the inner edge of flange 12 preferably lies substantially flush with the lower surface of the molded sheet 8 when it has been depressed to the position illustrated.

To complete the sink unit, a preformed sink or bowl 13 provided with a peripheral flange 14 may be positioned with its flange abutting the lower surface of the molded sheet 8 and secured to the depressed flange of the corrosion resistant sheet element of the composite table top by means of solder 15 such as "stainless" solder. By this manner of securing the sink and table top together, the corrosion resistant surface of the table top will appear to be integral with the sink bowl when the bowl is formed of a like corrosion resistant metal.

In order to complete the table top and to cover the side edges thereof, I may secure to the lower surface of the composite table top and adjacent the edges thereof fairly narrow strips 16 of wood or other suitable material, for example, by means of screws to provide a table top of requisite thickness at its edges whereby a standard-width molding strip of, for example, corrosion resistant metal may be attached thereto. Molding strips 17 may be positioned over the edges of the table top as shown and mitered at the corners thereof and, preferably, the depending lips 18 of the molding strips are soldered to the surface of the table top and along their mitered edges to provide a moisture proof joint therebetween. Of course, the marginal strips 16 may be dispensed with and any suitable molding strip may be attached thereto in any desired manner.

In bonding the corrosion resistant and carbon steel elements to the molded sheet product, I prefer to employ as the adhesive 7 a thermoplastic resin because ordinary adhesives require the presence of air to enable the solvent therein contained to evaporate and produce congelation. The thermoplastic resins which I prefer to employ are those which become adhesive when subjected to heat and pressure or which become adhesive when subjected to pressure alone. For example, I may employ a thermoplastic of the phenolformaldehyde type but I prefer to employ an adhesive comprising reclaimed rubber fluxed with a suitable resin and brought to the desired consistency by means of a solvent, such as so-called rubber solvents or a rubber solvent and a resin gum solvent, whereby the adhesive may be reduced to a spraying consistency. Another suitable adhesive of the latter, preferred type may comprise reclaimed rubber, a saponifiable resinous substance and a water-insoluble soap. The water-insoluble soap may be formed by adding to the mixture a small proportion of a metal oxide or hydroxide which is capable of reacting with fatty acids to form water-insoluble soaps. Oxides or hydroxides of magnesium, calcium, strontium, barium, aluminum, iron, lead, zinc, cadmium, etc. are examples of suitable metal oxides. The mixture may be thinned with a suitable volatile solvent and the adhesive will possess a high degree of strength, plasticity and tackiness at normal and elevated temperatures and it will not be materially affected by moisture. When adhesives of the character of the two last above described are employed, a very satisfactory bond between the metal sheets and the molded sheet product can be obtained under the application of pressure alone.

It is to be particularly noted that my composite product comprising a comparatively thin, corrosion resistant, alloy steel sheet and a comparatively heavy gauge, carbon steel sheet is much lighter in weight per unit of area than a sheet of corrosion resistant, alloy steel of a thickness equivalent to the aggregate thickness of said metal sheets, the cost thereof is considerably lower and subjection of such composite product to Rockwell tests has indicated that its corrosion resistant surface hardness was considerably greater than that of a specimen of like corrosion resistant, alloy steel of an equivalent thickness.

It is to be understood that in the foregoing description and appended claims the term "thermoplastic" is intended to designate those adhesives which will serve firmly to bond together the laminae of my composite sheet product when supplied therebetween and subjected either to heat and pressure or to pressure alone.

It will further be understood that the corrosion resistant, alloy steel sheets to which I refer are preferably formed of alloy steels coming within the ranges of so-called "stainless" steels though I may employ other corrosion resistant metals and by the term "carbon steel" I intend to include low carbon irons.

The term "sheets" as herein employed is in-

tended to include units of plate or strip dimensions.

What I claim is:

1. Those steps in the method of forming a composite sheet product adapted for use as a table top and the like and comprising a preformed facing element of comparatively light gauge, corrosion-resistant, sheet metal, a core element comprising a comparatively heavy gauge, carbon steel sheet and a backing element of a hard, molded sheet product, which comprise bonding together said facing and core element by means of solder and thereafter compositing said bonded elements to said molded sheet product with said carbon steel sheet as a core element by means of a thermoplastic resin and the application of heat and pressure.

2. Those steps in the method of forming a composite sheet product adapted for use as a table top and the like and comprising a facing element of comparatively light gauge, corrosion-resistant, sheet metal, a core element of a comparatively heavy gauge, carbon steel sheet and a backing element of a hard, molded sheet product, which comprise preforming said sheets in substantially like shapes and areas with openings therein adapted to be placed in registry but the opening in said corrosion-resistant sheet being somewhat smaller than the openings in said other sheets, bonding together said facing and core element with the openings therein in substantial registry by means of solder under heat and pressure, compositing said bonded elements to said molded sheet product with said openings in substantial registry and with said carbon steel sheet as a core element with a thermoplastic resin under pressure and depressing the marginal portions about the opening in said corrosion resistant sheet to overlie the side walls of the openings in the sheets therebeneath.

CLEMENTS BATCHELLER.