Jan. 29, 1946. A. J. WARTHA 2,393,668

TRANSPARENT STENCIL SHEET MATERIAL

Filed Jan. 6, 1941

Fig. 1.

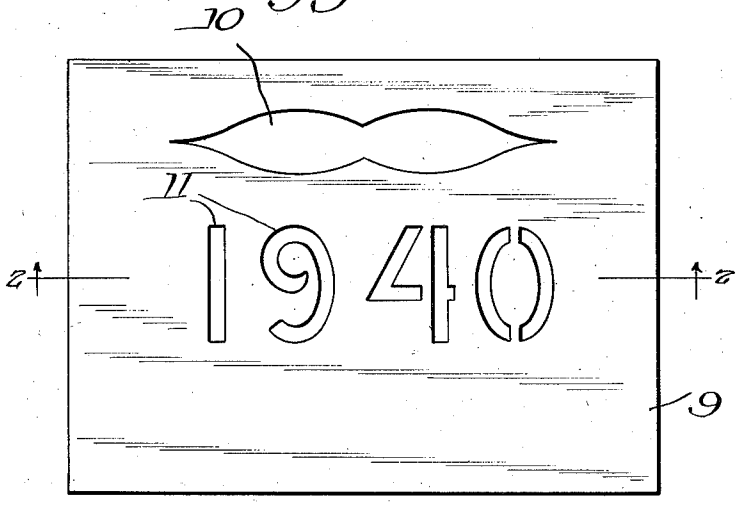
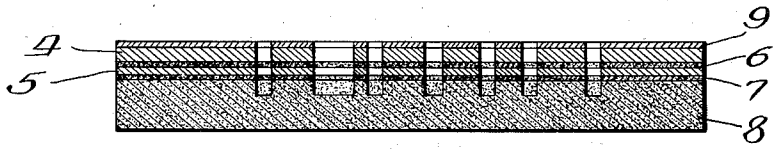


Fig. 2.



Inventor:
Alfred J. Wartha
By Paul Carpenter
Atty.

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TRANSPARENT STENCIL SHEET MATERIAL

Alfred J. Wartha, St. Paul, Minn., assignor to Minnesota Mining & Manufacturing Company, St. Paul, Minn., a corporation of Delaware

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5 Claims. (Cl. 41—39)

This invention relates in general to sheet materials and more particularly to improvements in such sheeted materials wherein the sheeting is of a nature to be inherently resistant to abrasion, such as it would be subjected to when used as a stencil for sandblasting operations, and especially to such materials provided with an adhesive coating which is also characterized by resistance to abrasion and is desirably of a pressure-sensitive nature. Furthermore, the adhesive is preferably water-insoluble and normally non-drying.

The invention has special utility as stencil material for limiting the application of fluid in the form of spray or otherwise, and also for limiting the area of a given surface exposed to the action of sand particles in a sandblasting operation, it being understood, however, that such limited fields of specific use are cited merely for purposes of illustration as examples of the utility of the invention in its several phases. A prime requisite of stencil material to be used in inscribing hard surfaces, such as granite, marble, glass, wood or plastics such as "Bakelite," by sandblasting, is that it must be sufficiently strong and resilient to resist abrasion by a stream under an air pressure of 100 pounds or over. It must be flexible to conform to extremely uneven surfaces on which it may be applied. It must be tough enough to withstand abrasion and yet it must be capable of being readily and accurately cut to form a stencil aperture of an intricate design. It must adhere to the surface to be inscribed firmly enough to prevent its displacement during the sandblasting operation and yet not so strongly as to injure the surface or cause adhesion thereto of particles of the stone surface upon its removal. The principal object of the invention is to provide a sheet composition having the foregoing highly desirable qualities.

One of the principal objects of the present invention is to provide a transparent laminated sheet adapted to be employed as a stencil in sandblast operations. While a high degree of transparency is not required, the material of my invention is sufficiently transparent so that print can be read through it, even though the composite is .025 inch thick or even slightly thicker. The invention in its broader aspects comprises a sheeted transparent material having high blast-resistant properties and provided on one surface with a thin coating of a transparent pressure-sensitive adhesive. The advantages of this composite in the monumental field, in which inscriptions and designs are placed on monuments of granite or marble or the like by sandblasting, are manifest, since the surface to be inscribed is visible to the operator through the stencil sheet before and while the stencil design is cut therein. Many of the sandblast stencil products known to the art are not adapted to readily and accurately receive designs applied by a crayon or pencil, due to their softness and resiliency, and, accordingly, my improved article increases the accuracy with which designs may be formed in the stencil material.

The improved transparent sandblast stencil sheet material is of particular utility in blasting intricate designs, known as "fine edge" or "shape carving," on monuments. Generally in blasting intricate designs, two or more stencil sheets are employed to obtain blasted inscriptions of varying depths, the desired preliminary design is first blasted through the apertures of a stencil sheet which is then removed and a second stencil sheet is then placed over the partially blasted surface and is provided with a complemental design to achieve the final outline. In such work, when the second complemetal stencil sheet is transparent as disclosed herein, it can be positioned more accurately and more quickly on the partially inscribed stone surface since the portions to be covered are visible through the transparent sheet. Furthermore, it enables the operator to avoid covering portions of the stone surface which should remain open to the second sandblast, since the entire surface to be blasted is visible at all times through the stencil sheet.

A further feature of the invention is the provision of a backsizing on the surface of the composite opposite from that bearing the adhesive coating. The backsizing is of such a nature that the adhesive will not offset thereon when the material is in roll form, thus eliminating the need of a liner, although, if desired, a liner of parchmentized paper or Holland cloth may be employed to protect the adhesive coating while the sheet material is in roll form, the liner being removed just before the material is to be applied to the surface to be blasted.

Broadly, the invention comprises a rubber compounded transparent backing sheet provided with a layer of transparent rubber base pressure-sensitive adhesive adapted to be attached firmly to the surface to be inscribed. The adhesive layer preferably comprises a thin sheet of paper or cloth, preferably Troya tissue, coated on both surfaces with the pressure-sensitive rubber base adhesive, one layer of the adhesive coating serving to firmly bond the Troya tissue to the back-

ing, and the other adhesive layer serving to attach the composite stencil sheet material to the stone to be inscribed.

The invention will be readily understood from the following description in conjunction with the accompanying drawing in which:

Fig. 1 is a plan view of the stencil sheet material with apertures cut therein to provide a design; and

Fig. 2, an enlarged vertical sectional view along the lines 2—2 of Fig. 1, showing the improved stencil sheet material provided with apertures and secured to the surface of a stone.

A satisfactory construction, embodying the foregoing highly desirable features, may be obtained by employing a composite backing including a layer which may be termed a compounded rubber sheet or rubber composition sheet, which may or may not be vulcanized and which has applied to one surface thereof a Troya tissue sheet having both surfaces coated with a transparent pressure-sensitive rubber base adhesive, this adhesive being preferably of the water-insoluble unified type compatible with the compounded rubber backing so as to have greater adhesion for the backing than for a surface to which the stencil sheet may be applied. To the other surface of the transparent compounded rubber sheet is applied a backsizing of glue upon which the adhesive will not offset when the composite material is in roll form.

The transparent rubber compounded backing sheet is preferably made up from a rubber compound including rubber such as latex crepe which may be vulcanized, magnesium carbonate, and a resilient dispersible filler having less cohesive strength than rubber and adapted to decrease the nerve and strength of the composite without destroying its blast resistance, such as factice. If the material is to be vulcanized, a sulphur bearing compound such as "Tetrone A" (dipentamethylenethiuramtetrasulfide) is added to the composition. Synthetic rubber, such as "Vistanex" and "Neoprene" may be employed in place of the natural rubber content of the backing. In this composition the magnesium carbonate ($MgCO_3$) provides a finely divided base material which is bonded together to form a coherent mass by the rubber. Other comminuted colorless crystalline base materials such as magnesium oxide or aluminum oxide may be employed instead of magnesium carbonate, in whole or in part.

Factice is a vulcanized or blown oil which mixes evenly with the rubber to increase the homogeneity of the mass and also serves to reduce the nerve of the rubber. This latter function is important in that the ordinary characteristics of rubber as to toughness and elasticity are not desirable in this composite sheet, as they would cause the sheet to be difficult to cut accurately to the desired design. Vulcanized vegetable oils (factice) have been found to be particularly suitable for this purpose. For example, such vegetable oils as vulcanized linseed oil, tung oil, cotton seed oil, corn oil, and sunflower seed oil, have been found to be satisfactory. The reduction of the nerve of the rubber is further accomplished by the intensive milling in the preparation of the composite material as hereafter disclosed. Other materials which may be employed as the resilient dispersible filler in place of factice, in whole or in part, are zinc naphthenate, bodied castor oil, blown tung oil, and a glue glycerine mixture.

For vulcanizing the compounded sheeting, if desired, such agents as commonly used for that purpose may be utilized, viz., for example, sulphur or sulphur-bearing agents as dipentamethylenethiuramtetrasulfide, selenium, m-dinitrobenzene, and the like, with or without the inclusion of an accelerator, as, for example, di-triphenylguanidine, tetramethylthiuram and piperidine derivatives.

While the proportions of these ingredients may be varied within reasonable limits, I have found proportions by weight according to the following formula to give a desirable composite sheet material:

Formula "A"

	Parts
Latex crepe rubber	8
Magnesium carbonate	4
Factice	1

The rubber content may vary from 8–10 parts of rubber by weight.

To form the rubber compound, the latex rubber is milled until the mass follows the mill roll and has the appearance of a smooth film covering the roll. This takes approximately ten minutes of milling. The factice and magnesium carbonate are then mixed together and are added to the milled rubber, and the entire mass is milled until the entire batch is thoroughly homogenized.

When the composite mass made according to the above formula has been thoroughly mixed, it is then sheeted or calendered to form a sheet of the desired thickness, which, for example, may be approximately 0.25 inch. The sheet is then allowed to cool for approximately twenty-four hours to impart firmness thereto.

When a vulcanized backing is preferred, smaller portions of a sulphur bearing compound, such as "Tetrone A" (dipentamethylenethiuramtetrasulfide), or the like, comprising .125 part based on Formula A is mixed with the compound of Formula A for approximately thirty minutes and sheeted and vulcanized at 220° F. for seven hours.

After a backing of the above composition has been formed with or without vulcanization, the resultant sheet is coated on one side with a transparent adhesive layer and on the other surface with a backsizing such as a thin layer of hide glue, white shellac or ethyl cellulose. The adhesive may be directly coated on the compounded rubber sheet or may be applied in laminated form as by preliminarily forming a composite comprising 2 point Troya tissue, or other suitable thin paper or cloth coated on both surfaces with a pressure-sensitive rubber base adhesive. The composite adhesive is then secured to the surface of the backing on the surface opposite from the backsizing and is securely retained thereon by means of the adhesive coating.

A suitable transparent pressure-sensitive adhesive to be employed as part of the transparent composite sandblast stencil sheet may be chosen from the following example:

Formula B

	Pounds
Milled latex crepe rubber	250
Ester gum	210
"Flectol B" (antioxidant)	1.25
Heptane (solvent)	2,300

The raw latex crepe rubber is preferably subjected to a double milling, that is, it is first milled for approximately ten to fifteen minutes with or without heating, and after aging for 24 hours is

again milled and is then cut into small pieces. The ester gum is dissolved in an equal amount by weight of heptane or other suitable solvent, and the "Flectol B" is likewise dissolved in a portion of the solvent. "Flectol B" is a liquid condensation product of acetone and aniline and is employed as an antioxidant to improve the rubber aging qualities. Other suitable antioxidants or age resistors are "Flectol H" (a solid condensation product of acetone and aniline) and "Solux" (p-hydroxy-N-phenylmorpholine). The solvent approximating 2300 pounds is placed in a suitable churn and the solutions of ester gum and "Flectol B" and the milled latex crepe are added. The mixture is churned until homogeneous, involving churning for about 40 hours at a temperature of about 70–100° F. The resulting adhesive solution is ready for use to form, upon spreading and evaporation of the solvent, a normally tacky and pressure-sensitive transparent adhesive coating and, as previously mentioned, may be coated directly upon one surface of the sandblast stencil sheet backing, or a thin tissue sheet may be double coated with the adhesive and applied to a surface of the sandblast stencil sheet backing in accordance with the detailed description of a suitable method of double coating a tissue sheet as set forth in U. S. Patent No. 2,206,899, issued July 9, 1940, to Kellgren.

Other volatile rubber solvents, such as benzol or naphthol, may be employed in place of heptane, and it will be understood that the proportion of solvent may be varied to produce the desired viscosity of the adhesive composition. Thus, the proportions in the above formula may be increased to make for easier brushing or spreading and a thinner coating.

To form adhesive coatings which are less tacky than that obtained employing proportions specified in Formula B, the ratio of ester gum may be reduced to as low as 0.2 part of ester gum per part of rubber, but the approximate ratios specified in the formula are preferred, since in employing the composite as a stencil sheet in sandblasting a tacky adhesive, a tacky adhesive is preferred in order that the stencil sheet may not be dislodged by the sandblast.

Formula C

Rubber	pounds	19.6
Nevillite resin 90° C	do	6.5
Nevillite resin 150° C	do	6.5
Heptane	do	155
Butyl stearate	grams	354
"Flectol B" (antioxidant)	do	44.2
Alcohol	do	266

The rubber employed may be a synthetic rubber, such as "Vistanex," an isobutylene polymer. The alcohol may be denatured ethyl alcohol, and the function of the alcohol is to reduce the quantity of rubber solvent required to produce a solution of desired viscosity.

The procedure of mixing the adhesive composition is the same as in the preceding example, and the proportions of resin to rubber may be reduced if a less tacky adhesive is desired.

Referring to the drawings, the reference character 4 indicates a backing sheet which may be formed from the composition of Formula A which may be vulcanized or unvulcanized, as previously described. The laminated adhesive material comprises a tissue layer 5, a pressure-sensitive adhesive coating 6 binding the tissue layer to the backing 4, and a pressure-sensitive adhesive coating 7 adapted to firmly retain the stencil backing upon the surface of a stone 8 to be inscribed. To the other surface of the backing is applied a thin coating 9 of the backsizing material, such as hide glue, shellac or ethyl cellulose, adapted to permit the composite stencil sheet to be rolled without offsetting the adhesive. The pressure-sensitive adhesive coatings 6 and 7 are preferably formed according to the Formulas B and C to provide a transparent pressure-sensitive adhesive coating. As previously mentioned, the design openings 10 and 11 are preferably cut in the composite stencil sheet after it is applied to the surface of the slab 8, the design being previously marked thereon by pencil or by a transfer, although it will be understood that the design may be marked out on the stencil sheet before it is applied to the stone and, accordingly, the design forming apertures 10 and 11 may be cut in the composite stencil sheet either before application to the surface of the slab or after such application.

Due to the resilient nature of the backing sheet 4, the particles of sand striking the surface of the stencil sheet material during the sandblasting operation are caused to be repelled or deflected without substantially wearing away this surface.

The tissue sheet 5 may be unified by treating it with a saturating solution which may be of a rubber resin base, prepared in accordance with the following:

Formula D

Formula E	pounds	154
Wood rosin	do	154
Benzol	gallons	122
Heptane	do	15

Formula E comprises:

Formula E

	Pounds
Reclaimed rubber	67
Latex crepe gum	7.5
Whiting	30
"Flectol H" (an antioxidant)	0.5

The latex crepe gum is prepared by milling for about 18 minutes, and the other components of Formula E are mixed with the gum and milled until the mass is homogeneous. After the wood rosin has been dissolved in benzol or other suitable solvent, it is added to the composition of Formula E, together with the heptane or other suitable solvent, such as benzol or naphthol, and the mass is dissolved in a churn. The Troya tissue layer is saturated with this composition, before the double coating of adhesive is applied, in the usual manner of impregnation to produce a treated tissue layer adapted to withstand splitting when it is unwound from the roll prior to usage better than an untreated tissue layer.

As previously pointed out, the tissue layer coated on both surfaces with a pressure-sensitive adhesive may be omitted if desired and the adhesive may be applied directly in a thin coating to the surface of the blast resistant backing 4 opposite to the surface coated with the backsizing 9. However, when the rubber in the blast resistant backing sheet is vulcanized, it is preferred to employ the tissue sheet since it tends to minimize the undesirable stretch of the vulcanized rubber.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. As a new article of manufacture, a transparent stencil adapted for use in cutting letters, symbols and designs on a surface by means of

sandblasting and comprising an abrasive resistant sheet adapted to be temporarily retained on said surface and formed of rubber and a comminuted colorless base material, the rubber being present in greater amounts by weight than said base material, together with less amounts by weight of a resilient dispersible filler having less cohesive strength than rubber and adapted to reduce the cohesive strength of said rubber without destroying its blast-resistance and to provide a sheet capable of being readily and accurately cut to form a stencil aperture, a coating of a transparent normally pressure sensitive adhesive on one surface of said sheet and a backsizing layer of the group composed of glue, ethyl cellulose or shellac on the other surface of said sheet.

2. As a new article of manufacture transparent sheet material having the properties of flexibility and resistance to impact of abrasive particles, said sheet material including a comminuted colorless base material bonded together by a binder comprising rubber and minor proportions of a resilient dispersible filler having less cohesive strength than rubber and adapted to decrease the nerve of the rubber without destroying its blast resistance, and a thin sheet of cellulosic material coated on both surfaces with a transparent pressure sensitive adhesive, one of said adhesive layers bonding said thin sheet to said sheet material and the other adhesive layer being adapted to firmly retain said sheet material on a surface to be inscribed.

3. As a new article of manufacture transparent sheet material having the properties of flexibility and resistance to impact of abrasive particles, said sheet material including a comminuted colorless base material bonded together by a binder comprising rubber and minor proportions of a resilient dispersible filler having less cohesive strength than rubber and adapted to decrease the nerve of the rubber without destroying its blast resistance, and a thin sheet of cellulosic material impregnated with a rubber base priming solution and coated on both surfaces with a transparent pressure sensitive adhesive, one of said adhesive layers bonding said thin sheet to said sheet material and the other adhesive layer being adapted to firmly retain said sheet material on a surface to be inscribed.

4. As a new article of manufacture, transparent sheet material having the properties of flexibility and resistance to impact of abrasive particles, said sheet material including a comminuted base material selected from the group consisting of magnesium carbonate, magnesium oxide and aluminum oxide, bonded together by a binder comprising rubber and minor proportions of a resilient dispersible filler having less cohesive strength than rubber and adapted to decrease the nerve of the rubber without destroying its blast resistance.

5. As a new article of manufacture, transparent sheet material having the properties of flexibility and resistance to impact of abrasive particles, said sheet material including a comminuted base material selected from the group consisting of magnesium carbonate, magnesium oxide and aluminum oxide, bonded together by a binder comprising rubber and minor proportions of a resilient dispersible filler having less cohesive strength than rubber and adapted to decrease the nerve of the rubber without destroying its blast resistance, and a coating of a transparent, normally pressure-sensitive adhesive on one surface of said sheet adapted to firmly retain said sheet material on a surface but having a greater affinity for said sheet material than for said surface.

ALFRED J. WARTHA.