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H. WARP

2,530,106

REINFORCED PLASTIC SHEET

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Fig. 1.

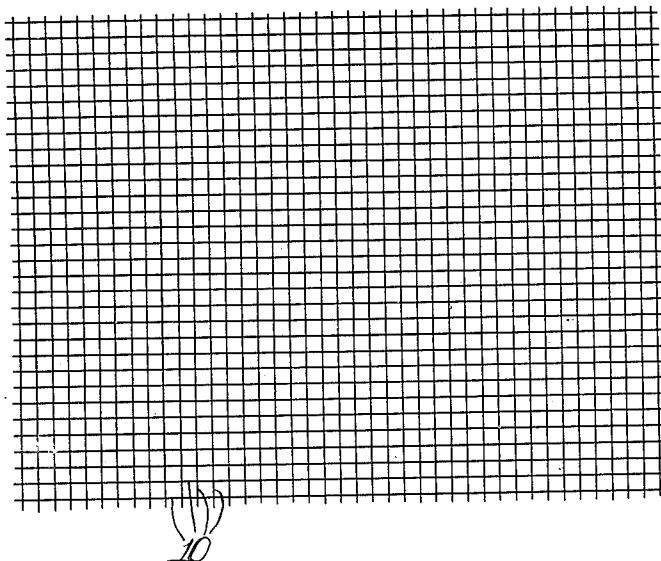


Fig. 2.

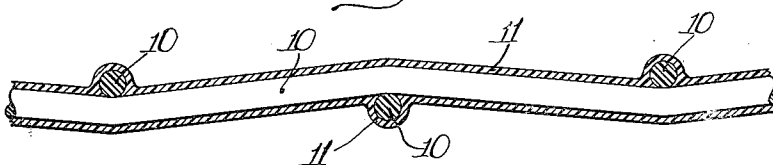
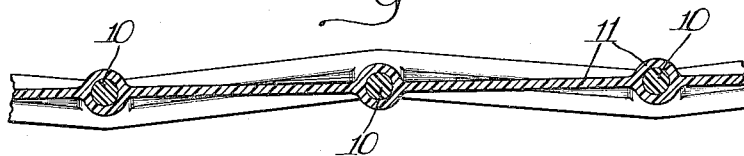


Fig. 3.



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REINFORCED PLASTIC SHEET

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1 Claim. (Cl. 117—138.8)

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This invention relates to a flexible synthetic material capable of transmitting ultra-violet rays, and relates especially to such a material containing spaced reinforcements of a flexible synthetic material. The invention relates particularly to spaced filaments of polyvinylidene chloride coated with a flexible synthetic polymer having a modulus of elasticity not less than that of the filaments.

One object of the invention is to provide an improved flexible sheet material capable of transmitting ultra-violet rays.

Another object of the invention is to provide an improved flexible sheet material containing spaced reinforcements therein.

Still another object of the invention is to provide an improved sheet material comprising a netting of spaced filaments comprising a synthetic polymer coated with a synthetic polymer having a modulus of elasticity not less than that of the netting.

A further object of the invention is to provide an improved sheet material comprising a netting of spaced filaments comprising polyvinylidene chloride coated with a synthetic polymer with the whole being capable of transmitting ultra-violet rays and the coating having a modulus of elasticity not less than that of the netting.

A still further object of the invention is to provide an improved sheet material comprising a netting of spaced filaments comprising polyvinylidene chloride that has been stretched cold to orient the fibers with the netting being coated with a vinyl polymer.

Another object of the invention is to provide an improved sheet material comprising a netting of spaced mono-filaments of polyvinylidene chloride that has been stretched cold to orient the fibers with the netting being coated with a copolymer of vinyl acetate and vinyl chloride.

Still another object of the invention is to provide an improved sheet material comprising a netting of spaced mono-filaments of polyvinylidene chloride that have been stretched cold to orient the fibers with the netting being coated with a copolymer comprising from 10% to 15% of vinyl acetate by weight and 85% to 90% of vinyl chloride.

Fig. 1 is a plan view of a group of filaments arranged in grid form to provide a netting.

Fig. 2 is an enlarged section showing the filaments coated with a flexible synthetic polymer, the section being taken just ahead of the filament shown in elevation.

Fig. 3 is an enlarged section showing the fila-

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ments coated with the polymer and the spaces between adjacent filaments bridged to make an impervious sheet material, the section being taken in the middle of a mesh.

The invention contemplates the provision of a sheet material either perforate or imperforate, adaptable for use in light admitting openings as a screen material or as a substitute for glass, the material being capable of transmitting ultraviolet rays particularly when in imperforate form. The material comprises generally a plurality of mono-filaments 10 of polyvinylidene chloride arranged in form of a grid. These mono-filaments have preferably been prestretched cold to orient the fibers and increase the tensile strength to approximately 20,000 to 40,000 lbs. per square inch. The filaments may be arranged as close together or as far apart as desired. In general, however, in a typical installation there will be about 8 filaments to the inch in the grid or netting.

As shown in Fig. 2 the filaments 10 are coated with a flexible synthetic polymer 11 having a modulus of elasticity not less than that of the filaments so that under an applied force the coating will stretch an amount equal to or greater than that of the netting formed by the filaments. As shown in Fig. 3 the filaments 10 are coated with the synthetic polymer so that the polymer bridges the openings between adjacent filaments. This forms one continuous sheet with the filaments 10 imbedded therein, and completely coated.

The synthetic polymer may be applied to the filaments in any convenient manner. One way is to form a solution of the polymer containing any of the usual plasticizing or other conditioning agents, and immersing the filament netting in the solution. The coated netting is then dried in any suitable drying apparatus such as a drying oven. The netting may be immersed in the polymer solution either by dipping it alone or by placing it on a flexible belt or the like. Of course any method of coating may be used.

Although the synthetic polymer that is used for the coating material may be any flexible polymer having a modulus of elasticity not less than that of the filaments, it is found that the vinyl polymers are preferred. These vinyl polymers are polyvinyl esters such as vinyl acetal, vinyl butyral, vinyl formal, vinyl chloroacetate, copolymers of vinyl chloride and vinyl acetate, or the like. Any vinyl polymer may be used so long as it withstands weathering, and is flexible. The vinyl esters will ordinarily contain plas-

ticizers that increase the plasticity and the elasticity. Typical plasticizers are phthalic esters, such as dibutyl, dioxy, dicyclohexyl, diethyl, cyclohexyl, butyl, and cyclohexyl amyl phthalates. Other plasticizers are the benzyl ethers of glycerol, such as dibenzylin. Suitable solvents are the esters, chlorinated hydrocarbons, ketones, aldehydes, nitrohydrocarbons, nitroparaffins, and the like.

It is preferred that a solvent be used to dissolve the coating polymers that will not appreciably attack the polyvinylidene chloride filaments. Those set out above have been found to be completely suitable.

One of the best coating compositions has been found to be a copolymer of vinyl acetate and vinyl chloride. In order that the polymer will have the required elasticity it is preferred that it contain from 10 to 15% of vinyl acetate by weight, and 85 to 90% of vinyl chloride. This copolymer is soluble in ordinary ketones, nitroparaffins, and acetate esters.

In the flexible sheet material of this invention each mono-filament is preferably from about 0.006 to 0.015 inch in diameter. Where the filaments only are coated, with the spaces between filaments being left open, the coating is preferably from about 0.001 to 0.003 inch thick. When the spaces between filaments are bridged over the coating on the filaments is preferably from about 0.002 to 0.003 inch in diameter and the "panes," or the portions of the coating between adjacent filaments, are preferably from about 0.003 to 0.005 inch thick. The thickness of the coating may be regulated by adjusting the fluidity of consistency of the coating solution; also more than one dip in the coating solution may be made if desired.

In a typical example of the invention polyvinylidene chloride mono-filaments that had been prestretched cold to orient the fibers were arranged to provide a netting. The filaments of the netting were each about 0.01 inch in diameter, and were arranged to form squares with about 8 filaments to the inch. A relatively thin solution of about 85 parts by weight of a vinyl chloride-vinyl acetate copolymer and about 15 parts by weight of dioctyl phthalate was prepared with cyclohexanone as a solvent. The netting

was immersed in the solution and dried. In most instances only one immersion was employed, although the netting may be immersed more than once if desired.

It is believed apparent from the foregoing that the coated netting possesses superior properties of elasticity and transmittal of ultraviolet rays. Any synthetic filaments may be used, so long as they have sufficient strength and can be caused to adhere to the coating material. Similarly, any coating material may be employed so long as it has the required elasticity and will adhere to the filaments.

I claim as my invention:

A reinforced sheet material transparent to ultraviolet rays throughout substantially its entire extent, said material comprising an open mesh of polyvinylidene chloride mono-filaments each of which has been pre-stretched when cold and having a tensile strength of 20,000 to 40,000 pounds per square inch, and a coating on said mesh and bridging the spaces between adjacent filaments comprising a transparent copolymer of 10 to 15% by weight of vinyl acetate and 90 to 85% of vinyl chloride, said coating having a modulus of elasticity not less than that of said filaments so that under an applied force the coating will stretch an amount at least equal to that of the netting formed by the filaments, the thickness of the coating on said filaments being generally less than the thickness of the coating bridging the spaces between said filaments.

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