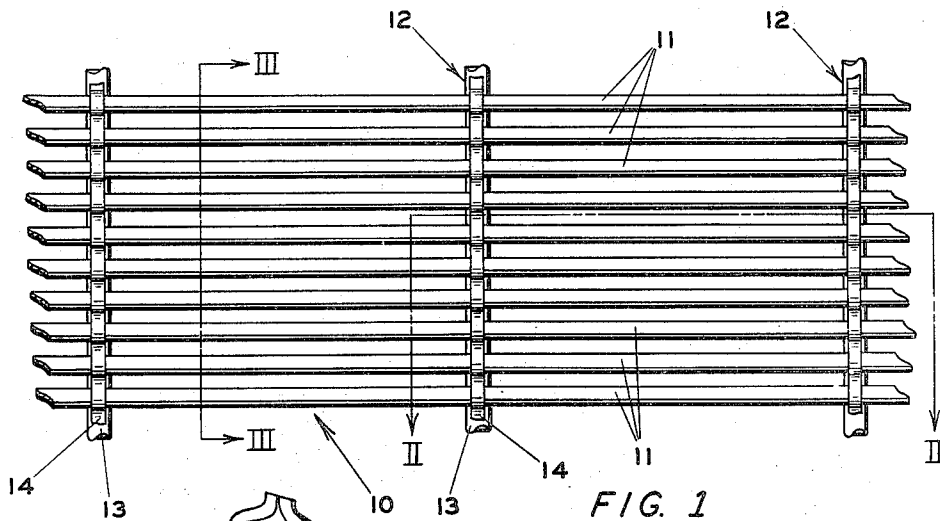
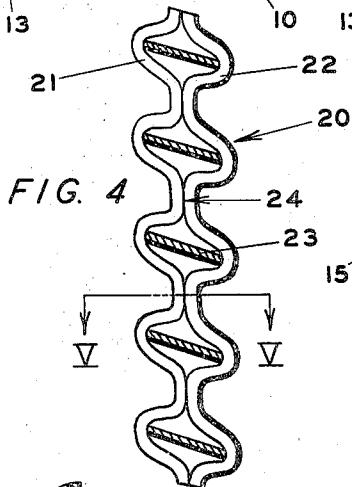
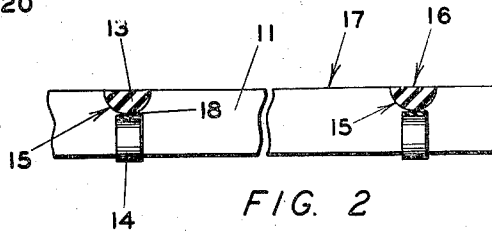
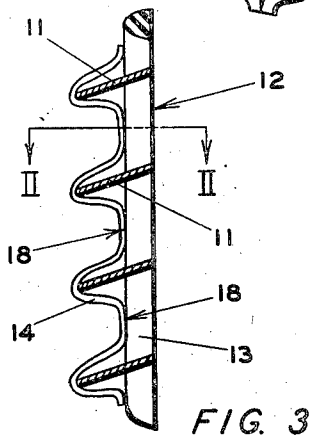
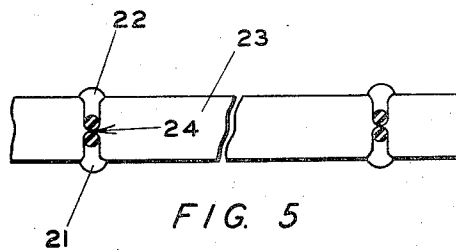


April 3, 1951

W. B. EWING ET AL
SUNSCREEN WITH PLASTIC WARP

2,547,632

Filed June 7, 1947



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2,547,632

SUN SCREEN WITH PLASTIC WARP

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Application June 7, 1947, Serial No. 753,206

2 Claims. (Cl. 154-46)

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This invention relates generally to a screen structure adapted for preventing the passage of insects and for preventing the passage of the sun's direct radiation at normal angles of incidence during the heat of the day, and relates more particularly to an improvement in the vertical, or warp wires thereof.

Since the inception of the combination insect and sun screen, many attempts have been made to eliminate or reduce those operations, constituting essential steps in the production of the present types of such screen, which are both cumbersome and time consuming. Paramount among such problems is that which concerns the manner in which the weft wires, or horizontal louvers, are engaged and held in spaced relationship with respect to each other by means of suitable warp or vertical wires.

Another problem in the fabrication of sun-screen concerns the electrolytic corrosion which attacks those bi-metallic sunscreens in which the warp and weft wires are made from dissimilar metals, such as aluminum and bronze. The moisture of the atmosphere provides the electrolyte which, given time to act, will not only discolor but also destroy the said bi-metallic type screens. Although the bi-metallic construction might otherwise be found advantageous, the said electrolytic corrosion precludes the successful use of this construction. Hence it also becomes desirable to provide a sunscreen construction in which dissimilar materials may be used for the warp and weft wires, in order to effect cost or other advantages, without encountering the said undesirable effects.

Those principal types of vertical wire constructions presently in conventional use include: the double, metallic wire type in which a plurality of wires in pairs cross or interlock between each metallic louver wire, examples of which are disclosed in the W. B. Ewing Patent No. 2,194,222 and J. J. Grebe Patent No. 2,078,940; the single metallic warp wire type in which the said louvers are secured, such as by brazing or soldering, to a plurality of uniformly spaced warp wires, an example of which is disclosed in our abandoned co-pending application, entitled Screen, Serial No. 736,600, filed March 22, 1947; and the integral wire type in which the said warp wires, as well as the louvers associated therewith, are stamped, punched, or otherwise shaped and formed, from sheets of suitable metallic materials, an example of which is disclosed in the J. J. Grebe et al. Patent No. 2,319,225.

Fabrication of each of the above-mentioned

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types of sunscreen involves processes and/or equipment which limit, in varying degrees, the output of such screen. Therefore, it becomes apparent that improvements in a combination sun and insect screen are desired which will materially reduce the cumbersome and time-consuming operations resulting from the use of the present types of warp wires.

In many of these known types of combination insect and sunscreen fabrics there is, unfortunately, little or no resilience. Hence, it is not only difficult to obtain a taut surface when a large section of the sunscreen is framed, but also it is virtually impossible even in smaller sections to restore said fabric to a taut surface after it has become bagged out due to normal hard usage.

It has also long been recognized that where a sunscreen is raised and lowered on a roll in the manner of a shade, it is desired to impart elasticity to said sunscreen in order to render it capable of use on a roll of small diameter. However, since sunscreen, due to its twofold purpose, does not lend itself readily to elasticity in a horizontal direction, any resilience in the sunscreen fabric must arise out of an elastic characteristic in the warp or vertical wires.

Attempts have been made to crimp, corrugate or otherwise deform metallic warp wires in an effort to produce elasticity therein. The difficulties and expenses encountered, however, make such methods impractical.

A further problem, arising out of the use of the conventional, metallic warp or vertical wires in the combination insect and sunscreen, involves their interference with the maximum free passage of light between the horizontal louvers of the said sunscreen fabric. Since light interference has always constituted an undesirable aspect in any kind of screen, it is apparent that any reduction in such obstruction to light passage is extremely desirable.

Accordingly, a primary object of this invention is to provide a combined sun and insect screen, of the general type disclosed by the above-mentioned patents, which will embody substantially all the advantages thereof, but which will particularly reduce the aforementioned time consuming operations incident to the construction and materials presently used in said screens.

A further object of this invention is to provide improved warp wire means in a combined sun and insect screen as aforesaid which is made of such material that it can be readily bonded or softened and adhered to other similar or dis-

similar materials by means of moderate applications of heat or suitable solvents.

A further object of this invention is to provide improved warp wire means as aforesaid which will substantially increase the output potential of a plant producing said combination screen while decreasing both the cost and the problems normally involved therein.

A further object of this invention is to provide improved warp wire means as aforesaid whereby the elasticity of said sunscreen fabric in the direction of said warp wires will be substantially increased.

A further object of this invention is to provide an improved warp wire means as aforesaid whereby the interference thereby with the free passage of light between the said horizontal louvers may be substantially reduced.

Other objects and purposes of this invention will become apparent to persons familiar with this type of equipment upon referring to the accompanying drawings and upon reading the following specification.

In meeting the aforesaid objects and purposes, as well as others incidental thereto and associated therewith, we have provided improvements in the vertical or warp wires of a combination type sun and insect screen. The said horizontal louvers, which may be of any suitable convenient type such as disclosed in the Ewing Patent No. 2,194,222, are supported by pairs of vertical wires or threads which are made of a type of material, usually an organic thermoplastic, which is longitudinally elastic and which becomes pliable and cohesive when exposed to either moderate heating or treated with a suitable solvent.

The louver wires lie between each said pair of resilient, uniformly disposed warp threads so that the planes established by each pair are substantially perpendicular to the plane of the entire screen. Each warp thread of each of said pairs meets the other thereof between each louver where said threads are bonded to each other, as aforesaid, by means of appropriate treatment with heat or a solvent. The said louvers or horizontal wires are held uniformly disposed and substantially parallel with respect to each other by said pairs of vertical threads.

For convenience, in the following description and claims, the sunscreen panel will be assumed to be in a vertical position with the long axis of the louvers extending in a horizontal position. It will be understood that this is for convenience of language only and implies no limitation to the position in which such screen may be used or to the applicability of the claims when such screen is used in other than the vertical position described and illustrated.

For illustrations of the improved sunscreen, attention is directed to the accompanying drawings in which:

Figure 1 is the front elevation view of a sunscreen employing a preferred embodiment of the improved warp wire.

Figure 2 is a broken sectional view taken along the line II—II in Figure 1 or Figure 3.

Figure 3 is a fragmentary sectional view of Figure 1 taken along the line III—III.

Figure 4 is essentially the same type sectional view as taken along the line III—III of Figure 1, but illustrates a variation in warp wire.

Figure 5 is a sectional view of the variation shown in Figure 4 taken along the line V—V therein.

As illustrated in Figure 1, the combination sun and insect screen panel 10 comprises a plurality of uniformly disposed, parallel, horizontal louvers 11 held in fixed angular relationship with respect to the plane of the screen by means of a plurality of the improved warp wires 12 to which this invention relates. Each said improved warp wire 12 may be comprised of a pair of cooperating warp threads 13 and 14, hereinafter described in detail, which lie substantially within a single plane on opposing sides of said plurality of horizontal louvers 11 and are brought together and suitably engaged to each other at points between said louvers. The said horizontal louvers 11 may be of any convenient, conventional type presently in use, but are preferably of metal, such as aluminum or bronze, and of elongated cross-section throughout their length, such as is illustrated in Figure 3 and is disclosed in the aforementioned Ewing Patent No. 2,194,222. Inasmuch as horizontal louvers of this general type are common knowledge in the art, further description thereof will be omitted.

The said cooperating, contacting warp threads 13 and 14 may be of any desired material, which is slightly resilient and which can be softened by the application of moderate heat, such as not in excess of 200° F., or by an easily handled solvent such as ethyl ether, but are preferably of a resinous or cellulosic substance, usually but not necessarily thermoplastic, hereinafter for convenience referred to generally as a plastic. Specific examples of suitable plastic materials include nylon, ethyl acetate, methacrylate, and the vinyl resins. It is obvious, of course, that the temperature, under which the plastic substance becomes pliable and/or cohesive, must be substantially higher than the anticipated maximum temperature produced by the direct radiation of the sun in whatever location the said sun screen is intended or likely to be used.

As illustrated in Figures 2 and 5 said warp threads may have any shape and/or cross-sectional size and contour as may be required, providing only that the combined tensile strengths of each said pair of warp threads constituting a warp wire will be sufficient to support its share of the entire sunscreen under conditions of normal usage. Such warp threads may be made of colored or uncolored plastics as desired.

The two cooperating warp threads of each warp wire are located substantially in planes, which are respectively perpendicular to the overall plane of the sunscreen. The said warp wires 12 are uniformly spaced and substantially parallel with respect to each other throughout the length of the sunscreen of which they are a part.

In one particular, preferred embodiment of the improved warp wire 12, as appearing in Figures 1, 2 and 3, the two warp threads of any given pair constituting said warp wire, may be of dissimilar shape and cross-section. The warp threads on the one side of the louvers are illustrated by the half round warp threads 13; here shown as the larger of the pair, though not necessarily so, which may be nested within appropriate notches 15 in said louvers 11, so that their exposed sides 16 are substantially flush with the adjacent edge 17 of each of said louvers 11.

The warp threads on the other side of the louvers are here illustrated by a thin flat strip constituting the said warp thread 14 which passes over and around each louver 11, as shown in Figure 3, thereby tending to conform to the

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contour of said louvers in order to engage the straight, relatively stiffer warp thread 13 at point 18 between each pair of adjacent louvers. The extent of said contact area 18 is governed only by the amount necessary to hold the louvers 11 in proper, predetermined, fixed positions with respect to each other and the entire sunscreen. In one satisfactory embodiment of the sunscreen having bronze louvers 0.050 inch wide, 0.005 inch thick, and spaced $\frac{1}{8}$ of an inch apart, the warp wires are spaced one inch apart, are comprised of pairs of suitably designed nylon warp threads, and have a contact area approximately $\frac{3}{8}$ of an inch in length.

In a modification of the preferred embodiment of said improved warp wire, illustrated in Figures 4 and 5, the warp wire 20 may be comprised of a pair of identically round, cooperating, contacting warp threads 21 and 22. As differentiated from warp threads 13 and 14 which constitute the warp wires 12, the said warp threads 21 and 22 of the warp wires 20 both bend around and tend to follow the contour of the plurality of horizontal louvers 23 which separate them. Consequently, said warp threads engage each other at 24 approximately midway between the adjacent louvers and substantially within a plane defined by the longitudinal centerlines of the said horizontal louvers.

As stated in connection with the warp wire 12 appearing in Figure 3, the extent of said engagement area 24 between the said warp threads 21 and 22 depends for the most part upon the amount of engagement necessary to hold the louvers 23 in proper predetermined, fixed positions with respect to each other, as well as the entire sunscreen, under normal conditions of use and treatment.

In one embodiment of this form of sunscreen, having horizontal louvers with dimensions and characteristics as mentioned above, nylon warp threads of .012 inch diameter proved satisfactory when contacting each other for approximately $\frac{1}{2}$ of an inch.

In order to produce a suitable bond between the cooperating warp threads of a warp wire, such as at the points 18 and 24 in the Figures 3 and 4, respectively, several conventional methods are available depending on the type of plastic used. For example, if thermoplastic materials are used for the warp threads, a heated pressure means of any convenient type, not shown, may be applied to those portions of either or both of the said warp threads which lie between the adjacent horizontal louvers, thereby first softening said parts and rendering them cohesive to each other, and then bringing them into contact with each other. Inasmuch as there is little or no resilience in the softened plastic, the engaged portions will remain in permanent engagement and without internal stresses after the heated pressure means is removed therefrom.

If soluble plastics are used for the warp threads, either or both of the opposing warp threads may be treated with a suitable solvent which will render them pliable and cohesive. A suitable pressure means is then applied to said softened plastic until engagement as aforesaid is brought about between the said warp threads and permanent fixation therebetween is thereby accomplished.

Appropriate amounts of heat or solvent may also be applied to said warp threads or to the louvers themselves so as to cause the plastic of said warp threads to flow to a controlled extent

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about that portion of said louvers engaged by the warp threads. Such flow of the plastic will close any cracks between louvers and warp threads through which rays of light may pass, as well as remove any internal stresses in the warp threads caused by their bending around the louver and cause them to grip the louver firmly.

The fabrication of sunscreens with warp wires of plastic or a similar non-metallic substance eliminates any corrosion due to bimetallic electrolysis, along with its well known resultant disadvantages.

It has been found in practice that there are certain optimum dimensions which may be applied to the type screen structure to which this invention relates without limiting the scope thereof. Thus, it may be observed that the said vertical or warp wires may be advantageously from three-quarters of an inch to one inch or more apart, which structure will provide ample strength without blocking the passage of any appreciable amount of light or diminishing the flexibility of said sunscreen. It has also been observed that the centerline distance between adjacent louvers is advantageously approximately one-sixteenth of an inch. A sunscreen having these dimensions, of course, represents only one of many possible examples.

If as aforesaid the said warp threads, hence the warp wires, are made of an elastic plastic material, the resultant sunscreen fabric, containing the elastic warp wires, will be provided with a resilience which will increase its residual resistance to rough treatment and render it more suitable to some special applications such as rolled screen.

It may also be observed that the use of transparent plastics for said warp wires substantially reduces interference by the screen with free passage of indirect light between the horizontal louvers, which interference is virtually inevitable where warp wires are of metal as in the conventional type of completely metallic sunscreen presently in use.

It will be clearly understood that the foregoing descriptions and related drawings of specific embodiments of the improved type warp wire to which this invention relates are given for purposes of illustration only, and it is not our intention, implied or otherwise, to eliminate other variations or modifications which do not depart from the scope of the invention unless specifically stated to the contrary in the hereinafter appended claims.

We claim:

1. A sunscreen panel having a plurality of similarly disposed, parallel, metallic louvers of elongated cross-section throughout their lengths and means holding said louvers in selected positions including a plurality of warp members arranged perpendicularly to the longitudinal axes of the louvers, the improvement in said means comprising: a plurality of spaced notches in at least one edge of each louver, the said corresponding notches in the several louvers being vertically aligned with respect to each other; each warp member including a pair of warp threads of resilient, synthetic, organic material opposed to each other on opposite sides of the sunscreen panel and engaging said louvers at the opposite lateral edges thereof, the warp threads on the side of said louvers having the notches being received therinto; the longitudinal cross sectional axis of each of said louvers extending trans-

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versely between said warp threads, said warp threads contacting each other between each of said louvers, said warp threads adhering to each other by the coalescence of the material thereof.

2. A sunscreen panel having a plurality of similarly disposed, parallel, metallic louvers, of elongated cross-section throughout their lengths and means including a plurality of warp members holding said louvers in selected positions and arranged perpendicularly to the longitudinal axes of the louvers; the improvement in said means comprising: a plurality of spaced notches in at least one edge of each louver, the said corresponding notches in the several louvers being vertically aligned with respect to each other; a pair of warp threads each of resilient, synthetic, or organic material comprising one of said warp members; the longitudinal cross-sectional axis of each of said louvers extending transversely between said warp threads; one thread of each of said warp members opposed to the other on opposite sides of the sunscreen panel and engaging said louvers at the opposite lateral edges thereof, the warp threads on the side of said louvers having

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the notches received into said notches and flush with the adjacent sides of the louvers, and both of said warp threads of each of said warp members contacting each other between each of said louvers, the area of contacting including a straight line and said threads in said area of contacting adhering to each other solely by the coalescence of the material thereof.

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