

[54] APPARATUS FOR FORMING PLASTIC LOUVER SCREEN

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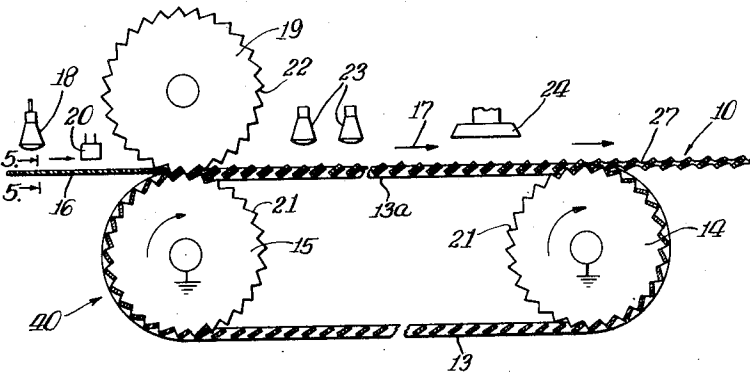
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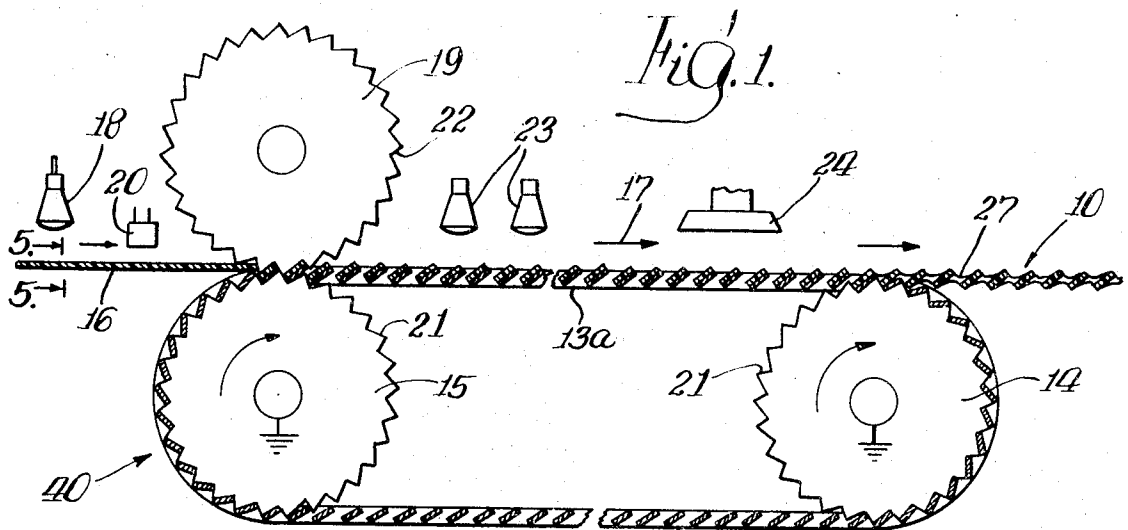
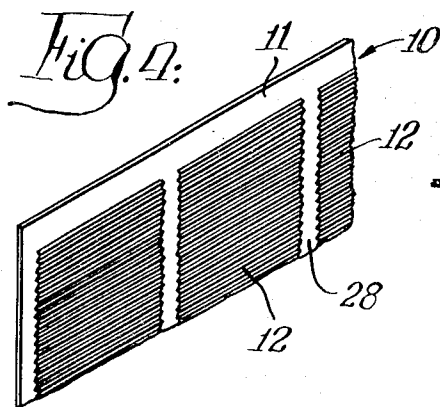
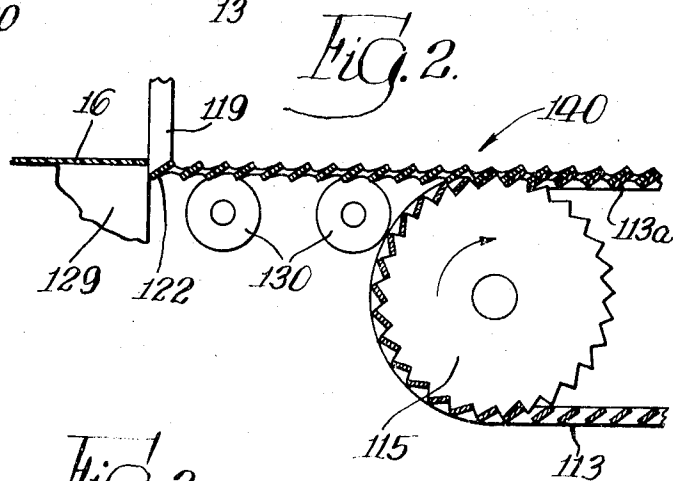
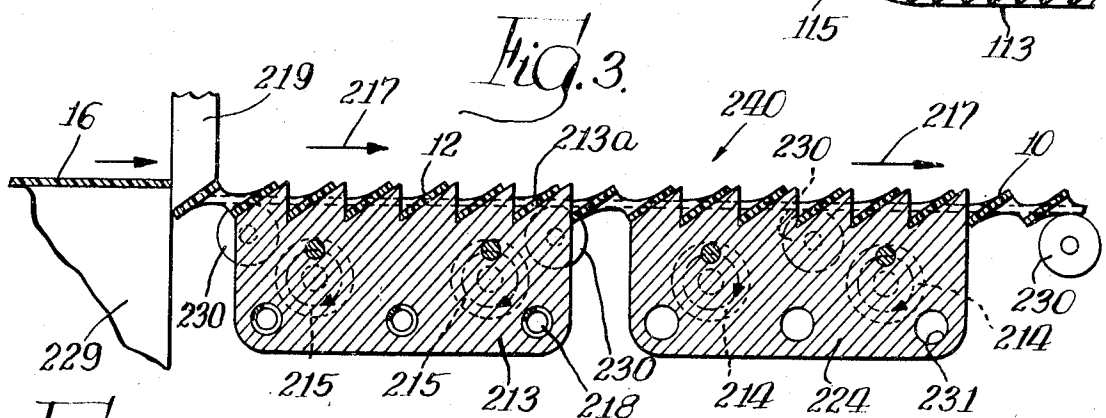
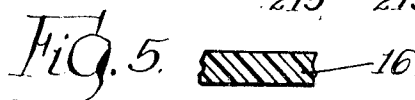
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[57] ABSTRACT

Apparatus for forming a plastic louver screen from a flat sheet of plastic material, said screen having a plurality of cut louvers twisted from the flat configuration of the sheet and permanently set without residual stress in the twisted configuration. The disclosed apparatus for forming the plastic louver screen includes a forming support member, means for softening the plastic sheet and cutting the plastic sheet to conform to the forming support member, thereby to provide in the sheet a louver screen configuration. The forming support member may comprise a plurality of block members having upper surfaces defining the metal louver screen configuration or a continuous belt defining the metal louver screen configuration. The louver screen is formed of a settable plastic. In one form, the louver screen includes a layer of metal which may be embedded therein or define a surface thereof.

15 Claims, 7 Drawing Figures





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APPARATUS FOR FORMING PLASTIC LOUVER SCREEN

CROSS-REFERENCE TO RELATED APPLICATION

This application comprises a division of the copending Harold Warp application, Ser. No. 660,478, now abandoned, filed Aug. 14, 1967, for "Plastic Louver Screen," and owned by the assignee hereof.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to louver screens and in particular to apparatus for forming plastic louver screens.

2. Description of the Prior Art

In one known form of louver screen of the venetian type, such as disclosed in C. Harter U.S. Pat. No. 2,596,997, issued May 20, 1952, and owned by the assignee hereof, a metal louver screen is formed by cutting a sheet of metal and forming the cut portions by twisting them out of the plane of the flat configuration of the sheet to define a plurality of louvers therein. The present invention comprehends an improved louver screen structure generally similar to the louver screen structure formed by the cutting and forming machine of the above-identified Harter patent, but formed of plastic material by means of a new and improved forming apparatus.

Thus, a principle feature of the present invention is the provision of a new and improved apparatus for forming a plastic louver screen structure.

Another feature of the invention is the provision of an apparatus for forming such a plastic louver screen structure including a forming support member having a louver screen configuration, means for feeding a strip of plastic material onto the forming support member, means for softening the fed plastic material, means for causing the softened plastic material to conform to the louver screen configuration of the forming support member to define a corresponding plastic louver screen configuration, means for setting the plastic material to define a set plastic louver screen, and means for withdrawing the set plastic louver screen from the setting means.

A further feature of the invention is the provision of such an apparatus for forming a plastic louver screen structure wherein the plastic material is a thermoplastic and the softening means comprises a heating means.

A still further feature of the invention is the provision of such an apparatus for forming a plastic louver screen structure wherein the means for causing the softened plastic material to conform to the metal louver screen configuration comprises means for cutting the softened plastic and urging it into conforming engagement with the forming support member.

Still another feature of the invention is the provision of such an apparatus for forming a plastic louver screen structure including electrostatic means for urging the cut plastic material into conforming engagement with the forming support member.

A yet further feature of the invention is the provision of such an apparatus for forming a plastic louver screen structure wherein the forming support member comprises a continuous metal belt.

Another feature of the invention is the provision of such an apparatus for forming a plastic louver screen structure wherein the forming support member comprises a block having an upper surface defining the louver screen configuration and means are provided for driving the block in a looped path.

A yet further feature of the invention is the provision of such an apparatus for forming a plastic louver screen structure wherein the setting means comprises a block having an upper surface defining the louver screen configuration and means are provided for driving the setting means block in a looped path.

Another feature of the invention is the provision of such an apparatus for forming a plastic louver screen structure wherein the means for causing the softened plastic material to conform to the louver screen configuration of the forming support member includes means for cutting the plastic strip prior to its being fed onto the forming support member.

Still another feature of the invention is the provision of such an apparatus for forming a plastic louver screen structure including means for tempering the plastic louver screen configuration to relieve stresses therein prior to the setting thereof.

Another feature of the invention is the provision of such an apparatus for forming a plastic louver screen structure wherein the setting means comprises means for chilling the tempered plastic louver screen configuration.

BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a schematic side elevation of an apparatus for forming a plastic louver screen structure embodying the invention;

FIG. 2 is a fragmentary side elevation of a modified form of apparatus for forming a plastic louver screen structure embodying the invention;

FIG. 3 is a fragmentary side elevation of still another modified form of apparatus for forming a plastic louver screen structure embodying the invention;

FIG. 4 is a fragmentary perspective view of a plastic louver screen structure embodying the invention;

FIG. 5 is a fragmentary transverse section of the plastic material of the plastic louver screen structure taken substantially along the line 5-5 of FIG. 1;

FIG. 6 is a transverse section of a modified form of plastic material for forming a modified form of louver screen embodying the invention; and

FIG. 7 is a transverse section of another modified form of plastic material for forming another modified form of louver screen embodying the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of FIGS. 1, 4, and 5, a plastic louver screen structure generally designated 10 is shown to comprise a flat plastic sheet 11 having a plurality of louvers 12 cut in the sheet 11, twisted from the flat configuration of the sheet and permanently set without residual stress in the twisted configuration of FIG. 4. As shown in FIG. 1, one form of apparatus generally designated 40, for forming such a plastic louver screen structure 10 includes a metal belt 13 which is looped about drive rollers 14 and 15 to be driven thereby in the looped path whereby the uppermost portion of the belt 13, generally designated 13a, comprises a forming support member having a louver screen configuration corresponding to the configuration of the plastic louver screen structure 10. In forming the louver screen structure 10, a suitable plastic sheet 16 is fed onto the forming support member 13a and caused to conform to the louver screen configuration of the forming support member. More specifically the plastic sheet 16 may be made soft and cut to lie conformably on the forming support member 13a as it is carried in the direction of the arrows 17 in FIG. 1. Illustratively, the plastic sheet 16 may be formed of a thermoplastic and may be softened by means of a conventional heat lamp 18 prior to the delivery thereof to a cutter 19 which cuts the sheet 16 and causes it to conformably engage the louver screen configuration of the forming support member 13a. To facilitate the conforming engagement of the plastic material to the forming support member, a conventional electrostatic charging means 20 may provide an electrostatic charge on the plastic sheet 16. The belt 13 and the rollers 14 and 15 may be suitably grounded to cause the electrostatic charge on the plastic sheet to cause the sheet to forcibly engage the belt 13, particularly in the cutting zone and at the point where the sheet first engages the forming support member 13a. As shown in FIG. 1, the rollers 14 and 15 may be provided with suitable toothed peripheries 21 to support the belt 13 and cooperate with the toothed periphery 22 of the cutting wheel 19 to effectively cut the plastic sheet 16 and twist the plastic material adjacent the cut into a louver configuration in engagement with the forming support member 13a.

In the illustrated embodiment, additional heating means in the form of heat lamps 23 may be provided for heating the cut plastic material conformed to the forming support member 13a to relieve stresses therein and permit a subsequent setting of the plastic material by suitable means such as cooling device 24 to permanently set the louver screen material 10 without residual stress in the twisted configuration.

As shown in FIG. 5, the plastic material 16 may comprise a sheet of homogeneous plastic. Illustratively, the plastic material may comprise any suitable plastic such as a fluorocarbon, styrene, propionate butyrate, vinyl, acrylic, or copolymer plastic material such as acrylic, butadiene or styrene copolymers. Further, illustratively, where the plastic comprises a butyrate, acrylic, vinyl, or similar plastic, the heating means 23 may be arranged to heat the conformed cut plastic to substantially its breakdown temperature which may be in the range of 200° to 400° F. In the illustrated embodiment, the belt 13 is formed of metal and may be formed by a cutting and forming machine such as disclosed in the above-described Harter patent.

As shown in FIG. 6, a modified form of plastic material 16a is shown to comprise a plastic material having a metal layer 25 embedded therein, the metal layer illustratively comprising aluminum foil. In FIG. 7, a plastic sheet 16b is shown to comprise a sheet of plastic having a metal layer 26 defining one surface thereof, and, illustratively, metal layer 26 may comprise a layer of aluminum foil.

The plastic material may be clear or colored plastic material as desired. Illustratively, it may be provided in sheet form having a thickness of between approximately 0.01 inches and 0.02 inches. The width of the slots 27 of the louvers 12 may be in the range of 0.05 to 0.01 inches, and the width of the louvers 12 may be approximately 1 inch. The screen structure 10 may be provided with approximately 17 louvers per inch, with imperforate strip portions 28 intermediate the portions provided with the louvers 12 and having a width of approximately one-eighth inch. Obviously, the specific dimensions of the louvers, the number of louvers per inch, and the width of the intervening strip portions 28 may be varied as desired by the manufacturer.

Referring now to FIG. 2, a modified form of apparatus for forming the plastic louver screen structure 10 is shown to comprise an apparatus generally designated 140 and comprising an apparatus generally similar to apparatus 40, but having a vertical cutting knife 119 provided with a cutting edge 122 cooperating with a table 129 for cutting the plastic sheet 16 at a point prior to the delivery of the cut sheet onto the forming support member 113a. The cut sheet may be carried to the forming support member by suitable means such as rollers 130.

In FIG. 3, a further modified form of apparatus generally designated 240 is shown to comprise an apparatus generally similar to apparatus 40, but having a cutting knife 219 cooperating with a cutting table 229 to cut the sheet 16 prior to the delivery of the cut sheet onto a block 213 having an upper surface 213a defining the forming support member. The block is carried on suitable rotary supports 215 for driving the block in a looped path so as to engage successive cut louvers 12 and move the cut sheet in the direction of the arrows 217 through the apparatus 240. As shown, a plurality of support rollers 230 may be provided to maintain the cut sheet in the flat plane of delivery while the block 213 moves downwardly, away from the cut sheet, to the left, and then back upwardly to reengage the cut sheet one louver arrangement to the left of the original engagement during each cycle of rotation of the block 213. As shown, the block may be provided with suitable heating coils 218 for softening the plastic material and causing it to conform to the forming support surface 213a when in engagement therewith during the movement of the block 214.

A second block 224 is provided for cooling the formed cut plastic sheet to define the final louver screen 10, and as shown in FIG. 3, may be carried on a suitable rotary drive means 214 in synchronization with drive means 215 for correspondingly advancing the cut formed plastic sheet one louver during each

looped movement of the block 224. As shown, cooling coils 231 may be provided in the block 224 for setting the plastic sheet in the twisted configuration without residual stress. As shown, additional roller supports 230 may be provided adjacent the block 224 for supporting the sheet during the movement of the block downwardly away from the plane of movement of the sheet through the apparatus 240. Rollers 230 may be arranged to support the sheet along the sheet spacer portions 28 similarly to the support of the sheet by roller supports 130 in the apparatus 140. As will be obvious to those skilled in the art, the apparatuses 140 and 240 may be used with homogeneous plastic material such as plastic material 16, as well as with the laminated plastic material such as plastic material 16a and 16b of FIGS. 6 and 7, as desired. If desired, continuous slide supports may be provided in lieu of the roller supports 130 and 230 to support the cut plastic sheet along the portions 28.

Thus, each of apparatuses 40, 140 and 240 is similar in providing an improved plastic louver screen, as shown in FIG. 4. Portions of apparatus 140 corresponding to similar portions of apparatus 40 are identified by similar reference numerals, but one hundred higher, and portions of apparatus 240 similar to corresponding portions of apparatus 40 are identified by similar reference numerals, but two hundred higher. Other than as discussed above, each of the apparatuses 140 and 240 functions similarly to apparatus 40.

The resultant louver screen 10 provides the highly desirable "venetian" screen effect, while being extremely simple and economical for construction. By maintaining the slit width relatively small, the louver screen is effective for screening out mosquitoes and other similar insects, while yet providing for substantial light and air transmission therethrough at a controlled angle.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

I claim:

1. Apparatus for forming a plastic louver screen, comprising: a forming support member having a louver screen configuration; means for feeding a strip of plastic material onto said forming support member; means for softening said fed plastic material; means for deformably piercing the softened plastic material suitably to conform to the louver screen configuration of said forming support member to define a corresponding plastic louver screen configuration; means for setting said plastic material on said support member to define a set plastic louver screen; and means for withdrawing said set plastic louver screen from said setting means.

2. The plastic louver screen forming apparatus of claim 1 wherein said plastic material is a thermoplastic and said softening means comprises heating means.

3. The plastic louver screen forming apparatus of claim 1 wherein said means for causing the softened plastic material to conform to the louver screen configuration comprise means for cutting the softened plastic and urging it into conforming engagement with said forming support member.

4. The plastic louver screen forming apparatus of claim 1 wherein said means for causing the softened plastic material to conform to the louver screen configuration comprises means for cutting the softened plastic and electrostatic means for urging the cut plastic material into conforming engagement with said forming support member.

5. The plastic louver screen forming apparatus of claim 1 further including means for tempering said plastic louver screen configuration to relieve stresses therein prior to the setting thereof.

6. The plastic louver screen forming apparatus of claim 5 wherein said setting means comprises means for chilling said tempered plastic louver screen configuration.

7. The plastic louver screen forming apparatus of claim 1 wherein said setting means comprises means for chilling said plastic louver screen configuration.

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8. The plastic louver screen forming apparatus of claim 1 wherein said forming support member comprises a continuous metal belt and further including means for driving said belt in a looped path.

9. The plastic louver screen forming apparatus of claim 8 wherein said driving means includes means conforming to said louver screen configuration and meshed therewith at the zone wherein said plastic strip is caused to conform to said louver screen configuration thereby to conformably support said belt at said zone.

10. The plastic louver screen forming apparatus of claim 1 wherein said forming support member comprises a block having an upper surface defining said louver screen configuration and means are provided for driving said block in a looped path.

11. The plastic louver screen forming apparatus of claim 1 wherein said setting means comprises a block having an upper

surface defining said louver screen configuration and means are provided for driving said block in a looped path.

12. The plastic louver screen forming apparatus of claim 1 wherein said means for causing the softened plastic material to conform to the louver screen configuration of said forming support member includes means for cutting the plastic strip prior to being fed into said forming support member.

13. The plastic louver screen forming apparatus of claim 1 wherein said strip comprises a sheet of transparent plastic and a layer of opaque material bonded thereto, said apparatus concurrently cutting said sheet and said layer of said strip.

14. The plastic louver screen forming apparatus of claim 1 wherein said strip has a layer of metal bonded to one surface thereof.

15. The plastic louver screen forming apparatus of claim 1 wherein said strip has a layer of metal embedded therein.

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