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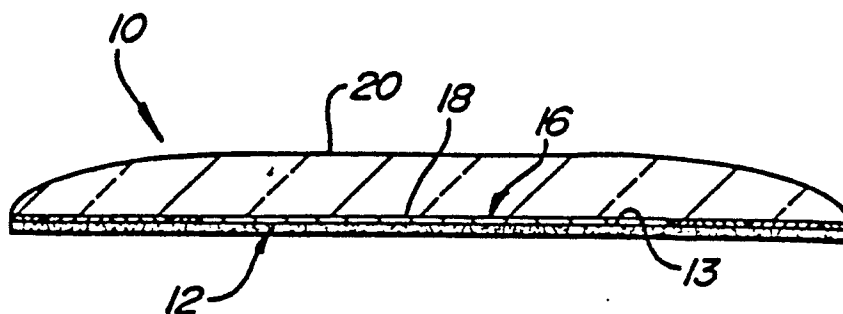
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(54) **Substrateless trim strip and method of making the same.**

(57) A substrateless trim strip (10) and method of making it are provided. A first surface (13) of a layer of pressure sensitive adhesive (12) is treated to render that surface substantially tack-free. The surface (13) is then decorated, and a plastic layer (20) is coated over the decorated surface to form the trim strip (10).

FIG-1



SUBSTRATELESS TRIM STRIP AND METHOD OF MAKING THE SAME

The invention relates to an elongate strip or molding of the type attached to an automobile body or the like for protection and decoration and methods for its manufacture.

Trim strips of various configurations have been used in the automotive industry to decorate and protect the surfaces of an automobile, especially body side surfaces. In recent years, emphasis has been placed on replacing chromed metallic trim strips with plastic trim strips which do not corrode and which can be attached to an automobile body adhesively without fasteners. Examples of plastic trim or molding strips include Waugh, U.S. patent No. 4,446,179, Madonia, U.S. Patent No. 4,206,155, Narita, U.S. Patent No. 4,220,681, Wenrick, U.S. Patent No. 4,010,297, Sawa et al, U.S. Patent No. 3,914,482, and Kent, U.S. Patent No. 3,843,425.

Many of these trim strips are formed on plastic resin substrates onto which another layer or layers of decorative metal or plastic are placed. For example, Waugh, U.S. Patent No. 4,446,179, discloses a trim strip having an adhesively-backed foil substrate of metal or plastic over which is cast a curable liquid plastic resin. The resin forms a lens cap over the substrate, giving a lens effect to the decorative indicia printed on the foil.

However, the need for such foil substrates adds to the costs of manufacture of such trim strips. Additionally, the thickness of the substrate may limit the overall flexibility of the trim strip and make it more difficult to adhere permanently to contoured surfaces. Accordingly, there is a need in the art for a trim strip and method of manufacture which is both inexpensive to make and has the requisite flexibility to mold and adhere to contoured surfaces.

The present invention provides a plastic-capped trim strip and process of manufacture in which decorative indicia and the like are printed directly onto the upper surface of an adhesive layer. The present invention eliminates the need for an intermediate metal, paper, or plastic substrate and produces a finished flexible elongate trim strip which is ready to be adhered to any intended surface such as the side of an automobile body. Likewise, it can be used as an insert for premolded trim, bumpers, or bumper guards or can be used to decorate other articles having contoured surfaces.

According to one aspect of the present invention, a plastic-capped adhesive article is made by providing a layer of pressure sensitive adhesive on a support surface. A measured amount of a curable plastic resin is then applied onto a first (upper) surface of the layer of pressure sensitive adhesive. The resin is then cured and hardened to provide an

assembly of a plastic cap over the adhesive layer. After formation of the plastic cap, individual articles may be die cut, stamped out, or otherwise separated from the assembly.

In a preferred method of forming the plastic-capped article, the layer of pressure sensitive adhesive is supported on a sheet or web of release liner which has been coated so that it may be readily peeled away from the adhesive article prior to use. The adhesive may be applied to the release liner in a conventional manner such as by spraying or roll coating. The adhesive may be clear, or is preferably colored.

The plastic cap which is formed may be in the form of a lens or positive meniscus which forms as the liquid resin is cast onto the adhesive layer. Alternatively, a relatively flat cap may be applied by flow coating, spraying, or extruding a liquid resin onto the first (upper) surface of the adhesive. These latter alternative procedures are preferred where a relatively large support sheet or web is used, and a plurality of articles may be then separated after the resin has cured.

Optionally, the first surface of the pressure sensitive adhesive may be rendered substantially tack free and suitable for the printing of indicia directly thereon prior to the application of the plastic cap. This procedure may be performed for all or only certain portions of the first surface of the adhesive, as desired. This may be accomplished by, for example, coating or spraying the first surface of the adhesive with a hardenable or curable liquid, by coating with a particulate material, by coating with a hot stamp foil, or by spray metalizing the surface. These detackifying procedures may leave either a clear or colored, transparent surface or may be opaque. In this manner, the color of the finished article may be determined by the color of the pressure sensitive adhesive, the color of the detackified surface, or a combination of the two.

The thus treated first (upper) surface of the adhesive may then optionally be printed or otherwise decorated by silk-screening or other conventional printing techniques. After the plastic-capped articles have been formed, and the plastic cap cured, individual articles may then readily be separated from the assembly by die cutting, stamping, or other conventional separation techniques. They may be supported on the release liner until they are ready to be applied to an intended surface.

According to another aspect of the present invention, a substrateless trim strip is made by the steps of providing an elongate layer of pressure sensitive adhesive on a support surface and for-

ming a plurality of spaced, elongate raised boundaries on one surface of the pressure sensitive adhesive. The raised boundaries are spaced apart to provide at least one open area running lengthwise on the elongate layer of pressure sensitive adhesive. This open area corresponds to the external shape of the final trim strip structure. The open area is then treated to render the upper surface of the adhesive tack free in this area and suitable for silk screening or otherwise printing directly on the treated upper surface. In another embodiment of the invention, the upper surface of the pressure sensitive adhesive is treated to render it tack-free and, then, raised boundaries are formed to create at least one enclosed area to be decorated.

The treated upper surface of the adhesive is then decorated, as desired, by silk screening or otherwise printing background colors and/or indicia thereon. A measured amount of a curable liquid plastic resin may be cast onto the decorated surface and flows to the edges of the raised boundaries. In this embodiment, the resin forms a positive meniscus over the decorated area without overflowing the edges of the raised boundaries. The resin is then cured and hardened to provide one or more elongate substrateless trim strips having plastic lens caps thereon. Again, a relatively flat cap may be applied by flow coating, spraying or laminating. After formation of the plastic cap, the individual trim strips may then be separated from the assembly. Preferably, that assembly also includes a release liner.

Thus, a preferred method of forming the trim strip of this embodiment includes providing the elongate layer of pressure sensitive adhesive supported on a release liner. The raised boundaries are formed by laminating to the adhesive surface cover strips, spaced apart to form at least one elongated open area. The open area is then treated, decorated, and has a plastic cap cast thereon as described above. After the trim strips have been formed, and the plastic cap cured, the individual trim strips may be readily peeled off of the release liner. The raised boundary formed by the cut edges of the cover strips acts as a knife edge of sorts such that when the trim strip is peeled from the assembly, the underlying adhesive will break sharply at those areas resulting in a trim strip having crisp edges. Alternatively a cutting operation may also be used to separate individual trim strips (with release liner attached) from the overall assembly.

The present invention thus provides a trim strip without the need for an intermediate metal, paper, or plastic substrate as required by prior art trim strips. The trim strip of the present invention provides increased flexibility and relative ease of manufacture.

Accordingly, it is an object of the present invention to provide a substrateless trim strip and process of manufacture. This, and other objects and advantages of the invention, will become apparent from the following detailed description, the accompanying drawings, and the appended claims.

Fig. 1 is a cross-sectional view of a trim strip produced by the process of the present invention as picked from the assembly;

Fig. 2 is an exploded perspective view in partial section of the decorated layer of pressure sensitive adhesive with cover strips thereon;

Fig. 3 is a cross-sectional view of the trim strip assembly prior to casting of the plastic resin;

Fig. 4 is a cross-sectional view of the trim strip assembly after the plastic resin has been cast;

Fig. 5 is a cross-sectional side view of a plastic-capped adhesive article produced by an alternative embodiment of the present invention;

Fig. 6 is a cross-sectional side view of a plastic-capped adhesive article having a detackified adhesive surface which has been decorated, produced by another embodiment of the process of the present invention; and

Fig. 7 is a cross-sectional view of an article produced by yet another embodiment of the present invention.

Fig. 1 illustrates in cross section a substrateless trim strip made in accordance with the process of the present invention. Trim strip 10 has a layer of pressure sensitive adhesive 12 having an upper and a lower surface. Pressure sensitive adhesive 12 can be any of a number of commercially available adhesives such as, for example, an acrylic pressure sensitive adhesive.

The upper surface 13 of adhesive 12 has been treated, as explained in further detail below, to render it tack free. As shown in the figures, a non-tacky surface 16 covers the upper surface 13 of adhesive 12. Non-tacky surface 16 is preferably a clear lacquer one, but may also be a particle layer (such as talc or mica). Alternatively a thin, bright metallic layer, approximately 0.0001 inch thick or less, may be applied by hot stamping or spray metallizing, and serves to provide a bright or colored background for indicia 18 printed thereon. Indicia 18 may be any desirable decoration including words, numbers, symbols, pictures, or combinations thereof. Adhesive 12 may itself be colored, by any number of means, to serve as a background for indicia 18 or, in some instances, eliminating the need for non-tacky surface 16 and indicia 18 (as for instance when the trim strip is to simply be the solid color of the adhesive).

In a preferred embodiment, a cured, clear plastic lens cap 20 overlies and encapsulates indicia 18. As can be seen from Fig. 1, the edge of lens cap 20 is contiguous with the layer of adhesive 12,

and forms a positive-shaped meniscus. This meniscus contributes to the lens effect of cap 20, enhancing the beauty of the printed indicia 18 while at the same time providing a tough, weather-resistant protective covering. Cap 20 may be formed of any castable plastic resin which is curable to a clear, tough compound. Preferably, a two-part polyurethane resin is used; although, other castable plastics may also be used. Such resins may be cured by either heat or exposure to ultraviolet or other radiation.

Referring now to Figs. 2, 3, and 4, the substrateless trim strip of the present invention is preferably produced by the following steps. Initially, a layer of pressure sensitive adhesive 12 is coated onto release liner 14. Adhesive 12 may be applied to liner 14 by any suitable means such as by spraying or roll or dip coating. Preferably, adhesive layer 12 is applied in a thickness of from between about 0.002 to 0.010 inches.

A plurality of spaced, elongate raised boundaries are formed on the upper surface 13 of adhesive 12 forming at least one open area running lengthwise thereon. The upper surface 13 is then treated, as described in further detail below, to render it tack free and suitable for printing directly on the treated surface. In a preferred embodiment of the invention as illustrated in Figs. 2, 3, and 4, the raised boundaries are formed by laminating cover strips 22 and 24 over adhesive surface 12. The ends of cover strips 22, 24 may be connected by an end strip 26 to form a unitary structure or assembly 30 which is laminated to adhesive 12.

As shown, one or more areas of assembly 30 has been removed, such as by die cutting, to leave the corresponding area or areas of adhesive 12 exposed. The periphery of these cut out areas correspond to the final shape of trim strips 10 which are produced. Cover strips 22, 24, 26 and assembly 30 may be of metal, cardboard, paper, or plastic. However, it is preferred that they be of a nonabsorbing material or be treated to be nonabsorbing. Suitable plastics include styrene or polyester having a thickness of approximately 0.004 to 0.008 inches. Alternatively in a continuous process, cover strips 22 and 24 will be laminated from feed rolls onto a web of release liner 14 having adhesive 12 thereon. In that instance, end stop 26 is not used.

In a preferred embodiment, the cover strips are treated to render their surfaces substantially non-wetting to the liquid plastic resin which is to be cast. Suitable treating agents, which may be applied to cover strips 22, 24, 26 either prior to or after the cut out areas have been removed, include fluorocarbon compounds such as polytetrafluoroethylene and silicones. A preferred treating agent for a polyester cover strip comprises a

mixture of polytetrafluoroethylene and Hypalon - (trademark of duPont). Hypalon, which is a chlorinated rubber material, improves the adhesion of the treating agent to the polyester substrate and increases the ductility of the coating. The treating agent may be applied in any suitable manner such as by screen printing, spraying, or roll coating.

The exposed areas of adhesive 12 are then treated to render the upper surface 13 of the adhesive tack free and suitable for printing indicia 18 directly thereon. The lower surface of adhesive 12 remains tacky so that the finished article may be adhered to an intended surface. The treatment of upper surface 13 of adhesive 12 to render it tack free may be accomplished by a number of different procedures. Preferably upper surface 13 may be overcoated with a clear or colored lacquer which forms non-tacky layer 16 and seals the upper surface of the adhesive. Alternatively upper surface 13 may be dusted with a fine powder of inert particles such as mica.

In yet another alternative procedure, a bright metallic surface may be applied to upper surface 13. This can be accomplished by applying a bright metal hot stamp foil to upper surface 13 by means of a pressure roll or the like. The foil is accompanied by a carrier film which is then stripped away leaving bright metal non-tacky surface 16. A metallic non-tacky surface may have a silver or gold color, or other colors may be used as desired. The overall thickness of bright metallic surface 16 is desirably 0.001 inches or less.

Once upper surface 13 of adhesive layer 12 has been rendered tack free, any suitable indicia 18 may be printed directly thereon. These indicia may include letters, numbers, words, symbols, pictures, or other decoration. The printing may be accomplished by any of a number of printing techniques which are known in the art, including silk screen printing. Adhesive layer 12 may itself be colored by the addition of suitable pigment or dye to the composition. If layer 12 is already colored, the need for printing a colored background is eliminated and, in that instance, the need for a non-tacky layer may also be eliminated.

After printing, a liquid plastic resin is cast onto the decorated surface and flows to the edges of cover strips 22, 24. In the preferred embodiment, the amount of liquid resin applied is controlled so that the resin forms a positive meniscus but does not overflow onto cover strips 22, 24. As mentioned, it may also be controlled so as to produce a relatively flat cap should the lens not be desired. Also as preferred, the nonwetting fluorocarbon coating which has previously been applied aids in controlling the flow of plastic. Apparatus suitable for

performing the casting operation is more fully described in Waugh, U.S. Patent No. 4,100,010, the disclosure of which is hereby incorporated by reference.

The plastic resin utilized is preferably a clear thermosetting material which is resistant to abrasion and impact. A number of plastics can be used for this purpose, but one which is particularly advantageous is an impact-resistant polyurethane. Polyurethanes useful in the practice of the present invention are two-part compositions which are the reaction product of a glycol, (such as a polyether or polyester glycol, and an aliphatic diisocyanate.

The cast plastic resin is cured or otherwise hardened to form a lens cap 20. The resin is preferably cured by heating or ultraviolet radiation. However, depending on the particular composition utilized, other methods such as radio frequency heating, hot air drying, or even the heat of an exothermic curing reaction may be utilized.

In this preferred process, the edges of the cover strips 22 and 24 act as a knife edge of sorts to sharply cut the adhesive layer as the capped, trim strip as shown in Fig. 1 is separated from the release liner. The polyurethane cap has firmly bonded to the indicia bearing adhesive and the trim strip is, thus, cleanly separated from the assembly.

In an alternative embodiment, the trim strip may be cut from the assembly. In that instance, it is not necessary to use cover strips 22 and 24 and other methods may be used to form the raised boundaries. These include the methods taught in Reed, U.S. Patent No. 4,259,388, and Gilleo, U.S. Patent No. 4,409,264, which are incorporated herein by reference. Likewise, a raised boundary may be formed by an embossing operation. In this embodiment, it is desirable to render the upper adhesive surface tack-free prior to formation of the raised boundaries. The remaining steps are the same as discussed above.

Figs. 5 and 6 illustrate, in cross-section, plastic-capped adhesive articles produced by alternative embodiments of the present invention. Article 40 has a layer of pressure sensitive adhesive 42 having a first upper surface 43 and a second lower surface. The lower surface of adhesive 42 is adhered to a release liner 44 or other releasable support surface.

The adhesive 42 may then optionally be treated to render the upper surface 43 of the adhesive substantially tack free and suitable for printing indicia 48 directly thereon as discussed above. The lower surface of adhesive 42 remains tacky so that the finished article may be adhered to an intended surface. Once upper surface 43 has been treated and rendered substantially tack free to yield a printable surface 46, any suitable indicia 48 may be printed directly thereon.

Adhesive layer 42 may itself be colored by the addition of suitable pigments or dyes to the composition. If layer 42 is already colored, the need for overprinting a colored background and/or treating the upper surface 43 of adhesive 42 to render it substantially tack free may be eliminated. Likewise, if layer 42 is clear, areas of the upper surface of the adhesive may be left undecorated by indicia 48 so that when the article is applied to a substrate, the color or brightness of the substrate shows through in those areas.

After application of the layer of adhesive 42, as shown in Fig. 5, or after printing, as shown in Fig. 6, a curable liquid plastic resin is applied onto the structure. In the embodiment shown in Fig. 5, where individual articles are being formed, the liquid plastic resin is cast onto the structure and flows to the edges of the structure forming a positive-shaped meniscus. This meniscus contributes to the lens effect of plastic cap 50 which is formed when the resin is cured.

Alternatively, a relatively flat cap, such as is illustrated in Fig. 6, may be applied by flow coating, spraying, or extruding a liquid resin onto the upper surface of the structure. These latter alternative procedures are preferred where a plurality of individual articles are supported on a single larger sheet, roll, or web of release liner 44. Once plastic cap 50 has been cured, individual articles may then be die cut, stamped out, or otherwise separated from the larger sheet. In one embodiment, the individual articles may be kiss-cut (i.e., cut through to release liner 44) and left on the larger sheet or roll. In this manner, they may be shipped to ultimate users who may then readily peel the individual articles from release liner 44 for adherence to intended substrates.

In the embodiment shown in Fig. 7, article 60 has a layer of pressure sensitive adhesive 62 having an upper and a lower surface. The lower surface of adhesive 62 is adhered to a release liner 64. The upper surface 63 of adhesive 62 has been treated, as explained in further detail above, to render it substantially tack free. As shown in the figures, a non-tacky surface 66 covers the upper surface of adhesive 62. Once upper surface 63 of adhesive layer 62 has been rendered substantially tack free, any suitable indicia 68 may be printed directly thereon. After printing, a clear or colored plastic sheet 70 is laminated to the assembly. Any of a number of different plastics may be utilized depending upon the effect desired, and the intended environment for the article. For example, tough weather-resistant plastics such as polyurethanes or polycarbonates may be utilized if the article is to be exposed to outdoor conditions. If flexibility is desired, the layer may be a polyester

or polyolefin plastic. To insure that the plastic layer adheres permanently to the decorated assembly, the lower surface of layer 70 may have an adhesive thereon to bond to the assembly.

In one method of manufacture of the embodiment of Fig. 7, a plurality of individual decorated articles may be supported on a single larger sheet or web of release liner 64. Liquid plastic resin may then be cast, coated, sprayed, extruded or otherwise applied over the entire sheet or web. Such a procedure produces a relatively flat plastic cap over the entire sheet. Then, individual articles may be die cut, stamped out, or otherwise separated from the larger sheet. In a preferred procedure, the individual articles may be kiss-cut (i.e., cut through to release liner 64) and left on the larger sheet. In this manner, they may be shipped and sold to ultimate users who may then readily peel individual articles from the release liner 64 for adherence to intended substrates.

In the practice of the present invention, a unique substrateless (i.e., meaning that there is no self-supporting paper, cardboard, or plastic stock as such) article is produced which is useful as trim strips on automobile bodies, inserts for bumpers and bumper guards, or as decoration or reflectors on tailgates, walls, doors, protective headgear, and the like.

While the invention has been described in detail and by reference to specific embodiments thereof, it will be apparent that numerous modifications and variations are possible without departing from the scope of the invention, which is defined in the appended claims.

Claims

1. A method of making a substrateless trim strip characterized by the steps of:

a) providing an elongate layer of pressure sensitive adhesive (12),

b) treating a first surface (13) of said pressure sensitive adhesive to render said first surface substantially tack-free and suitable for printing directly on the treated surface,

c) decorating said treated surface by printing indicia (18) directly thereon, and

d) coating a plastic layer (20) onto said treated surface to form a substrateless trim strip (10).

2. The method of claim 1 wherein said coating step includes casting a curable liquid plastic resin onto said treated surface and curing said resin to harden it.

3. The method of claim 1 wherein said coating step includes laminating a transparent plastic layer to said treated surface.

4. The method of claim 1 wherein said coating step includes extruding a transparent plastic layer onto said treated surface.

5. The method of claim 2 including the step of forming a plurality of spaced, elongate raised boundaries (30) on said first surface (13) of said layer of pressure sensitive adhesive (12) to provide at least one open area running lengthwise on said elongate layer of pressure sensitive adhesive, prior to said casting step, and casting said liquid plastic resin so that it flows to the edges of said plurality of boundaries, filling the area therebetween.

6. A substrateless trim strip (10) comprising an elongate layer of pressure sensitive adhesive (12), the upper surface (13) thereof being treated to render it tack-free, decorative indicia (18) printed directly on said tack-free, treated upper surface of said pressure sensitive adhesive, and an elongate plastic cap (20) over said decorative indicia.

FIG-1

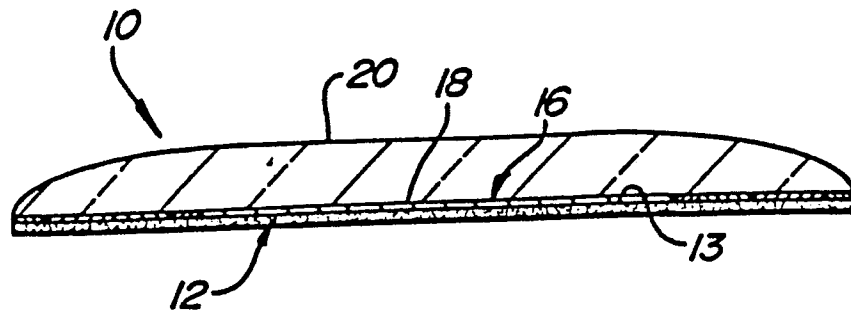


FIG-2

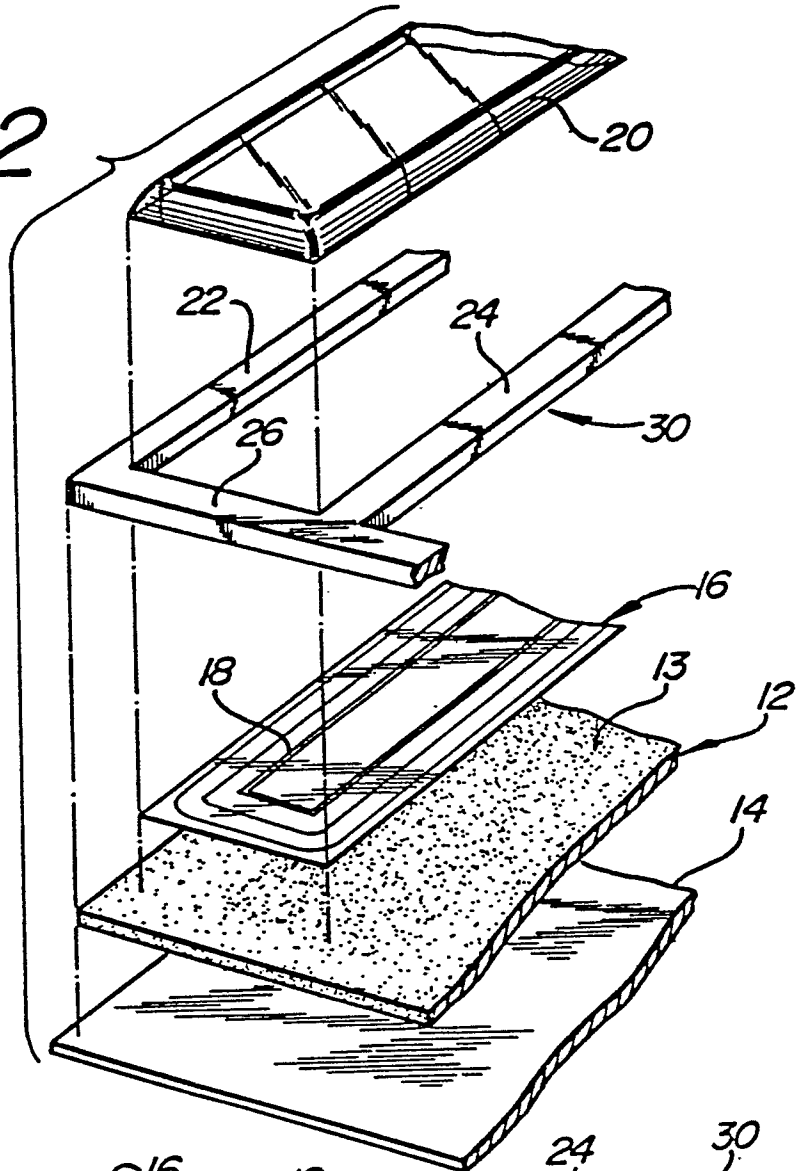


FIG-3

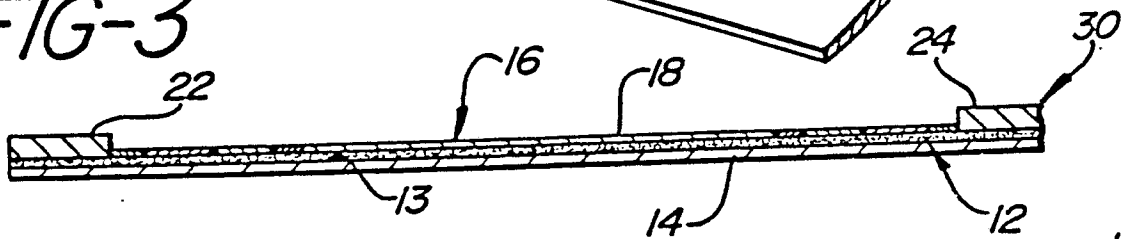


FIG-4

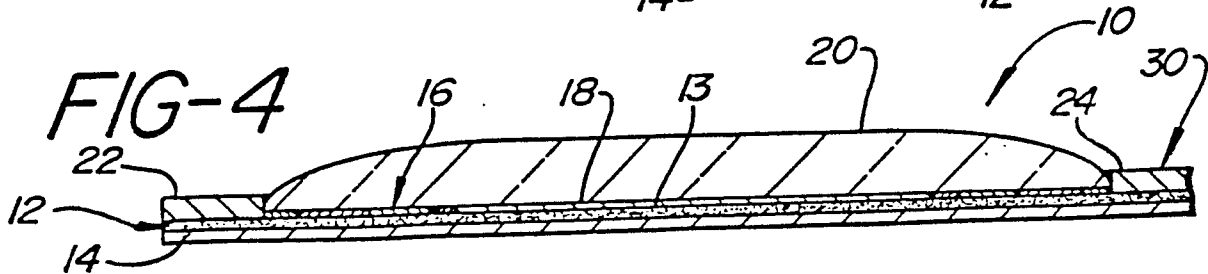


FIG-5

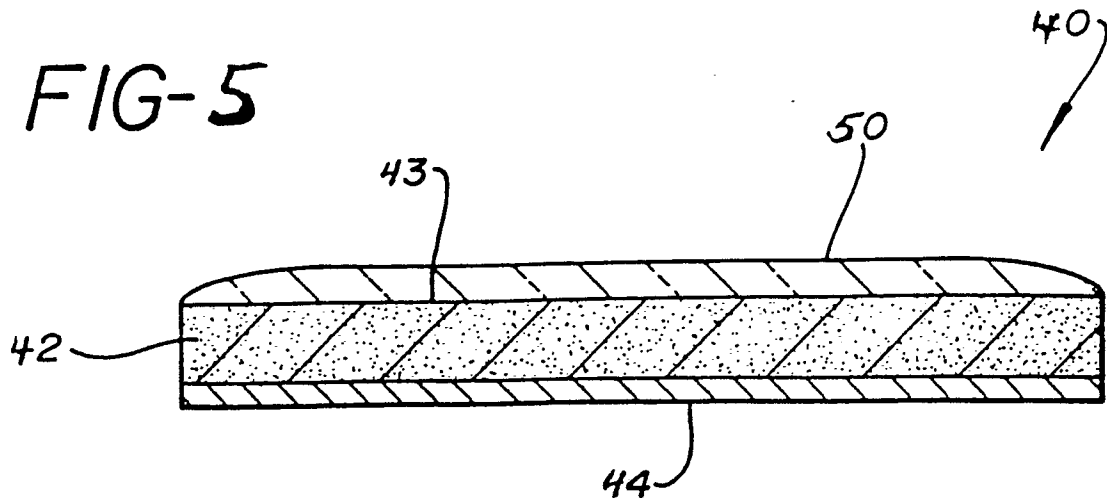


FIG-6

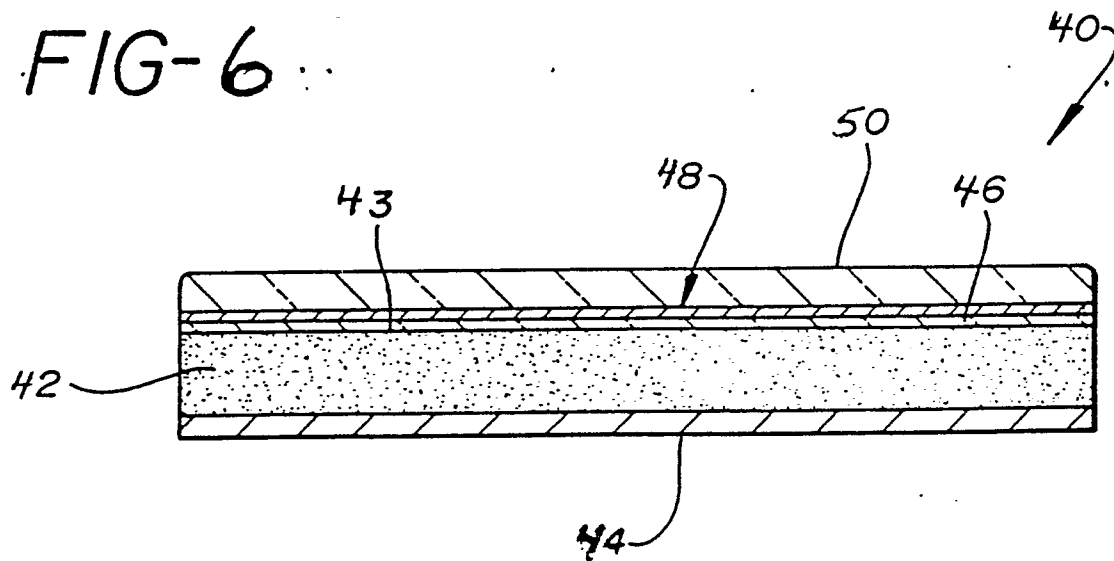


FIG-7

