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(71)(72) Applicant and Inventor: ROSS, Gregory, E. [US/US]; 2007 Long Leaf Court, Santa Rosa, CA 95403 (US).

(74) Agents: FEIX, Thomas, C. et al.; 241 North San Mateo Drive, San Mateo, CA 94401 (US).

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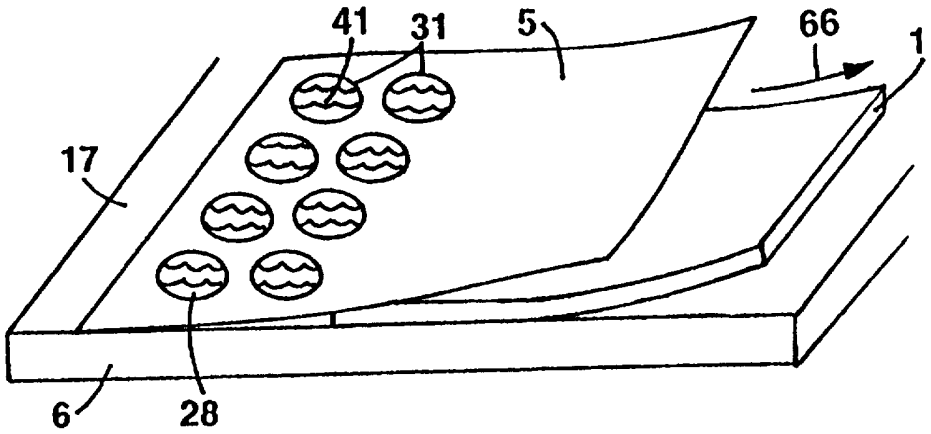

(57) Abstract

A method of forming a scratch resistant color ink pattern of multi-color coatings (5) onto a see-through panel (6) with exact registration between successive color coatings of the pattern. The method of the invention includes the steps of: providing a base material (1) having an ink printable release coating on one side thereof; applying a first color coating of ceramic ink (75) to the printable release coating side of the base material (1); applying at least one additional color coating of ceramic ink (76) over at least a portion of the first color coating of ceramic ink (75); perforating the base material to provide a pattern of light passages (28) therethrough, the light passages (28) defining aligned edges of successive color coatings of ceramic inks to ensure exact registration between said successive color coatings of ceramic inks; transferring the pattern of color coatings of ceramic inks (5) onto a surface of a see-through panel (6); and heating the see-through panel (6) to fuse said pattern of color coatings of ceramic inks (5) onto said surface of said see-through panel (6). In one embodiment, the base material (1) consists of water slide paper and such that the pattern of color coatings is wetted and transferred to the see-through panel by water slide transfer. In another embodiment, the base material consists of heat transfer paper and the pattern of color coatings is transferred by application of heat and pressure or just pressure alone.

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PERIMETER COATING ALIGNMENT

FIELD OF THE INVENTION

This invention relates to the application and uses of coatings and the like applied to an original base, intermediate or final surface for numerous purposes including display means and as a perimeter coating alignment means useful for numerous purposes.

BACKGROUND OF THE INVENTION

There exists numerous needs that have thus far not been filled for printing or other imaging or coatings application that can provide a precise edge limit to a material and to one or more coatings thereon.

It is useful when a coating has an end point or a transitional point between two separate coatings. For example, when it is intended to have transparent areas beside partially or fully opaque areas; or when two separate colored or structured coatings are in direct edge contact or with a defined gap between them; or when it is desired not have any overlap between two solid adjoining coatings such that the overlapped portion would present a different appearance of color due to the overlapping coatings; or when it is desired to have large numbers of defined edges when forming a pattern where light may be transmitted through a material, accurate coating, printing or painting is necessary.

There are many situations, including lithography, offset and smaller sizes of screen printing where good quality of registration is possible. However, any mis-registration may not be visible in the general area of the print, but becomes very noticeable along the edge of the print area because the mis-registration of one or more colors show up against the non-printed background.

The term "coating application" or "print"or "printed" or "printing"or "transfer"or "printing surface" or "high surface", or similar, as used herein, includes, but is not limited to, any method of applying or positioning a coating onto or in close proximity to a base or other surface and include traditional methods such as screen print, lithography, offset, ink jet, digital printing, sublimation, paint jet, electrostatic attraction of repulsion, magnetic attraction of repulsion, or any other method of causing a visible or invisible coating to be applied on or in close proximity to a base or other material or substrate or another coating or substance and includes new technology print application methods when developed. Application methods also include: paint jet, powder transfer, vapor deposited metals, hand applications, such as brush, air brush, roller, spray and the like, gravity, liquid flow, blade coating, reverse roll coating, reflective materials or treatments.

However, many printing processes are unable to maintain an exact registration of edge

alignments, in repetition, because of small variations in the printing process. Examples of this include slippage of the material and of the equipment itself, which cause minor movements of the print registration. Also, changes in temperature, stretching of the screen mesh, expansion and contraction of metal machinery and the like, all can contribute to variations in registration.

There are numerous other uses for perimeter coating alignment. For example, it is not currently possible to accurately print multi-color grid patterns on the sunroofs of automobiles. Typically, the sunroof has a grid pattern to permit visibility through the sunroof and yet to restrict the heat radiated from the sun onto the occupants of the vehicle. To provide effective outward visibility, the coating, usually ceramic ink and black in color is printed either as discrete dots or as a coating pattern with holes in the black coating. The commonly used printing method is screen printing. With the present invention, it is now possible to retain the current pattern of black on the passengers side of the sunroof, and yet from the outside have numerous possibilities which are advantageous. By being able to add a color or multi-colors, manufacturers can now color coordinate the exterior side of the sunroof grid pattern to the color of the vehicle, incorporate the car manufacturers logo and provide decorative treatments. The colors on the outside are not readily visible to the passengers on the inside, who still retain their visibility through the sunroof.

The present invention provides significant advantages in the areas of light control where quantities of light can be adjusted by the installation of the material onto a see through surface such as a window. As a heat control method, the present invention can offer gradiated open area possibilities where it can be installed on a window to reduce the amount of sunlight entering a building. This can also be enhanced by the addition of reflective material on the outside of the present invention to further reflect sunlight, reduce heat absorption in the material, and therefore heat into the interior of the building. Another use is as a decorative material in combination with a variety of surface coatings. Security applications can also benefit whereby the material acts as a vision barrier in one direction while providing visibility from the other side, such as in surveillance uses at airports or at security gates and other similar applications.

There are numerous uses for the present invention, including being able to control the location of and limit the perimeter of one or more types or combinations of coatings on one or more bases or coatings on or in other surfaces or materials and these will become readily apparent in the teachings of the present invention.

DESCRIPTION OF THE DISCLOSURE

The advantage of perimeter printing is to provide control of the edge perimeters but the

same advantages may accrue using combinations of coatings and alignment methods or other structures, as taught herein. The term "perimeter printing", "perimeter surfaces", or similar, as used herein, includes, but is not limited to, all the subject matter of the present invention and includes the definitions of "perimeter" and "printing" and is intended to mean a printing or coating apparatus and process providing substantially accurate registration whereby the limits, or perimeter, of the printing or coating area or areas are defined, repeatable and controllable and this in turn produces a precise result in accordance with the teachings of the present invention, and as a process to produce numerous products for numerous purposes. The term "control", "perimeter control", "boundary control", or similar, as used herein, includes, but is not limited to, the effect whereby the perimeter is a partial or fully limiting factor to the location of a coating or coatings such as to prevent application of coatings in a normal layer from exceeding the perimeter or edge. The term "edge", "edges", "cliff", or similar, as used herein, includes, but is not limited to, any one or more perimeters of a material wherein at least one surface or layer is at a different height or position to another surface or layer. The position of the edge is defined by the change of direction from one surface or plane of a material or materials to another surface or plane, whether the plane is flat or curved and may be at right angles to the plane of any surface of the material or at any other angle to the plane of the material and there may be multiple edges in any one material and numerous and varied angles of edges or combinations of angles or positions of an edge or edges on any one or more pieces or sections of material. The term "coat" or "coated" or "coatings", or similar, as used herein, includes, but is not limited to, visible and invisible substances such as inks, paints, powders, flowable solids, solidified liquids, metals, including precious metals and ceramic frit.

There exists numerous needs which have thus far not been filled for printing or application of other imaging or coatings that can provide a precise edge limit to the material and to one or more coatings.

Screen printing equipment due to well known factors, makes it difficult to produce good registration in large sizes. A mechanical repeatability of one millimeter on a five meter long screen printing press is considered good quality. When doing four color process, this tolerance is quite acceptable. However, where it is required to have thousands of defined edges in the print surface, such that only one color must be seen from one side of transparent material and another color or multi-color image from the other, this tolerance is not adequate as the misaligned colors will become visible at the perimeters of the edges due to this misregistration. The term "edge",

"side wall", "boundary" or similar, as used herein, includes, but is not limited to, an edge portion whereby one plane of the base changes direction in one or more places into a second plane and at the point of the angle or angles of change, is considered to be the perimeter of the area intended for coating.

While it is possible to make multi-layer prints, it has not been possible to have certain segments of that print area with two or more layers in perimeter edge alignment. It is possible to use mechanical or laser cutting as a means of cutting through the multi-layers of one or more coatings to form a sidewall edge.

It is desirable to be able to present visual images such as logos, advertising, decorative colors, color coordinated designs and other visual patterns while still retaining visibility through the non imaged part or parts of the surface. The term "decorative" or "image", or similar, as used herein, includes, but is not limited to, light reflective substances, color or colors, and other visible indicia, applied to the base and to other coatings may also be subsequently transposed to another surface whereby an image is readable by the natural eye. In addition, the decorative coating may be a monochromic coating of only one color or one material The use of perimeter printing allows for multi colored, multi layered coatings which can leave discrete area or areas of the see-through material free of coating to allow visibility from one side to the other, or images on at least a part of both sides.

Therefore, it is possible to provide a printed scene on one side, while the other side provides the best arrangement of light transmittance namely a clear see through surface with a substantially black partial coating. The term "black",or similar, as used herein, includes, but is not limited to, any substantially dark typically monochromic, light absorbing color or coating or substance which has low level of light reflectance and a high level of light absorbency. These uses require durable long-life structures and coatings which are not readily available without the present invention.

Other examples of observation would include: in jail where a degree of observation capability is desirable; retail stores where the replacement of the traditional strip mirror glass, which is a piece of glass with alternating stripes of reflective mirror interspersed with stripes of transparent glass, is now possible by providing a decorative image from the shopping or consumer side or a coating which looks similar to the surrounding walls, or an advertisement for a product sold in the store. The consumer would see this section as an advertising display, not a surveillance or observation situation. Surveillance is one use of these teachings, to provide an ability for

viewing from one side of the material whilst not be seen from the other side of the material. For vehicle windows, it would still retain visibility from one side of the see through surface to the other, typically from the inside to the outside, and the outside visual appearance could be a mono color to match the vehicle color or a multi-color decorative pattern, such as vehicle logos, pattern stripes, advertising message, personal communication messages, company logos or any other decorative pattern desired.

Sports applications, such as squash courts with see through surfaces have used a discrete white and black dot direct printing, or, using small paper transfer decals, a black and white dot partially overlaid one on top of the other. Colors have also been used to delineate the lines of the "ball in play" line. Because of the technical limits for printing in register, larger areas of glass have necessitated making individually small decals up to 60cm to 80cm. Even within this small decal size, it has not been possible to provide exact registration of the dots, which have typically been ceramic ink and transferred onto the glass. Additionally, the decals have been solid in construction and this has caused production difficulties in removing the water from under the transfer paper or decal at the transfer step prior to tempering or toughening the glass. The present invention provides for holes in the base, such as transfer paper decals, which allows for efficient and effective removal of the water from under the surface area of the decal and the water forms in the holes in the ceramic ink transposed on the base. The term "transpose", "transposing", "transposition", or similar, as used herein, includes, but is not limited to, the action or result of moving one or more coatings from one or more layer or layers of one or more bases such as to reposition the coating or coatings on one or more alternative materials including glass. There are numerous methods of transposition including transposition via, for example, heat, pressure, direct contact, adhesive, water slide, gravity, and any one or more combinations of the above methods or techniques, other means which effect the movement of one or more coatings from a base to a secondary material or which cause movement of the coatings from one portion to another of a particular material, base, or materials whether in partial areas of coatings or in full areas of coatings or whether in partial transposition of coating or full transposition of coating or any combination of these. Also, coatings may be transposed or transferred from one section to another of a base or final surface using any of the disclosed means or other methods of causing movement from one portion of the base or bases to another. The term "surface", or similar, as used herein, includes, but is not limited to, one or more parts of a intermediate or final use material such that a surface may be flat, formed, curved or combinations thereof and may be partially covered with coatings or completely covered.

Therefore, a second or third surface is made after applications of a first and second layer of coatings respectively. A surface may also be in the interior or exterior portion, or one side, or the other or both sides of any layer or layers or surface. Surfaces may be treated, coated, imaged, or modified in many ways.

The term "base", "bases", "base substrate", "base material", "base", or similar, as used herein, includes, but is not limited to, a structure which comprises one or more edges or perimeters for the purposes of acting as a base of a coating or coatings. A base may be paper, plastic, or new materials not yet invented or multiple layered laminate constructions of any one or more of the above materials or any other material capable of temporarily, semi-permanently, or permanently, or partially, retaining a coating. The base can be reusable, or repeatable with a precise pattern, or partially modified for release. The base can be one or more materials which may be used as temporary or permanent materials for the creation or modification or transposition of coatings. The base may be temporarily attached to the final surface or may act as a media for the transposition of one or more coatings to a permanent installation. A base may also be the intermediate or final surface and may be transparent or opaque or partly transparent, according to the installation. The base may be prepared by many methods, including die cut, laser cut, hand cutting, punching and any other known or future means of creating certain shapes, patterns, angles, edges and perimeters on any material.

Permanent advertising, sponsor, and identification messages are all now possible on one side of glass which is visible through the see through surface from the opposite side.

BRIEF DESCRIPTION OF THE FIGURES

Figs. 1A-E are cross sections of an edge followed by the steps of adding coatings, transposition to another surface, and removal of the base after transposition.

Fig. 2A is a typical rotary die cutting apparatus to produce a version of patterns to create bases or alternatively to cut multi-layered material for multiple identical bases, or alternatively to cut combinations of bases and one or more coatings on one or more bases.

Fig. 2B is perimeter coating alignment of the letter "A" comprising four different layers in perfect alignment, two layers being thicker than the others.

Fig. 3A is a cross section of a base with two thick coatings and four thin coatings on either side of a cavity such as for a light passage.

Fig. 3B is a perspective view of a base, ready for coating, including pad or transfer printing.

Fig. 4A is a cross section view of a see through surface comprising light absorbent, insulative and heat reflective coatings.

Fig. 4B is plateau perimeters receiving coatings being transposed to an intermediate or final surface and the multi-layer coatings remaining attached to the final surface.

Fig. 5A is a see through surface such as an automobile sunroof from the inside looking out.

Fig. 5B is a multi color image on the opposite side of a see through surface with, for example, a automobile manufacturer logo.

Fig. 5C is an exterior view of a see through surface, such as an automobile window comprising glare control on the top surface, multi-color or one color indicia, and perimeter treatment.

Fig. 5D is the visibility through the same surface of Fig. 5C without obstruction despite different colors and densities of coating.

Fig. 6 is a multi-layer structure with a solid liner on the back of the base and a protective over-laminate or transfer medium being added to the right hand surface of the multi-layered coatings.

Fig. 7A is a perspective view of a base comprising round holes placed on a solid liner.

Fig. 7B is a cross section through those holes showing five coating with the hole cavity producing one or two way vision light passages.

Fig. 7C is wetting the transfer medium, prior to transfer.

Fig. 7D is a perspective view of the transfer decal waterslide application step showing water in the holes ready to evaporate off without causing bubbling of the coatings during firing.

Fig. 7E is the coating transposed onto a see through surface such as glass and being fired or tempered in a furnace causing evaporation of the water through the holes.

Fig. 7F is a typical hot roller method of heat transferring indicia from a base to an intermediate or final surface.

Fig. 7G is a direct or contact transfer step to show coatings applied to an alternative surface.

Fig. 7H is a plan view of coatings.

Fig. 8A is the removal, after transposition, of a base for one way vision purposes, where the base used round staggered hole patterns to align the perimeter edged coatings.

Fig. 8B has a similar function to Fig. 8A, but using an alternate pattern, in this example, parallel stripes, alternating between image and light passages.

Fig. 9A is a cross sectional view of a base with light passages coatings applied to the perimeter of the available material and an adhesive coat applied as the last coating ready for direct transfer or other application methods.

Fig. 10A shows three coating levels in perfect register directly attached to a see through surface such as a glass window via the firing or fusion process.

Fig. 10B is the same as Fig. 10A except the attachment method was a form of adhesive.

Fig. 10C is a cross section of a double sided two way vision, two way image, material attached to a see through surface.

Fig. 10D is a laminate of at least two materials such as laminated glass or plastics or combinations with a one way vision series of aligned coatings attached to one side.

Fig. 10E is the same construction of Fig. 10D except that the alignment of the color image and the black coatings are placed on the opposite side of the surface or surfaces.

Fig. 11A is a combination of a glass see through surface together with two transparent substrates such as film or rigid plastic attached via adhesive on one side and static or heat attachment on the other and with images aligned such that from one side full vision is obtained of the image whilst from the other side it is possible to see through the structure at certain angles.

Fig. 11B is a similar concept as Fig. 11A except that the images are facing in two directions or there are two different images facing in opposite directions such as to make vision possible in certain light conditions in one directions whilst making horizontal visibility through the material in the other direction virtually impossible.

Fig. 11C is two see through surfaces joined together with one identical or two different images facing in opposite directions.

Fig. 11D is two different transparent surfaces, adhesively attached to a see through surface with one or more images facing in one or both directions.

Fig. 11E is the use of multiple coatings on one side of the see through surface and the precise positioning of a matched spacing coating partially offset on the other side.

Fig. 11F is similar to Fig. 11E but the coatings on the right side are placed directly in alignment with the light passages of the left side.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1A shows a perimeter edge for use in applying coatings for alignment or registration purposes where the base **1** has a corner to form an edge **2**. The coating surface **9** is at right angles to the face of the perimeter surface **3**. The coating surface **9** and the perimeter surface **3** join at the

edge **2**.

Fig. 1B has an additional, for example, four layers of coatings **5** applied on base **1** showing that the perimeter of the four coatings **5** are aligned above the perimeter **3**, and in contact at a release point **14**.

Fig. 1C shows the base **1** with coatings **5** transposed to an intermediate or final surface **17**, where the vertical wall **18** has aligned the four layers of coatings **5** and has brought the top layer of the coatings **5** into contact with the surface **17**, ready for separation at the release point **14**.

Fig. 1D shows the base **1** removed via the transposition removal step **24** such that the base **1** separated at a release point **14** on the base, and the coatings are positioned on the surface **17**. The base is then removed or either disposed of, or reused.

Fig. 1E shows the coatings **5** now attached to the surface **17** of a material such that the perimeters **3** of the coatings **5** are in alignment. Also, coatings may be transposed or transferred from one section to another of a base or final surface using any of the disclosed means or other methods of causing movement from one portion of the base or bases to another.

The term "energy", or similar, as used herein, includes, but is not limited to, forces or radiation that are naturally created or man-made, such that energy is available in proximity to or in contact with or impinges on one or more coatings. By way of example, energy may be sunlight, electrical current energy, magnetic energy, radiation, sound waves, light waves, microwaves, electromagnetic, magnetic, electrical fields, forces of friction or reduction of forces of friction, light, heat, cold or any other form of energy or combinations of forms of energy.

The term "perimeter coating", or similar, as used herein, includes, but is not limited to, the subject matter of the present invention and includes the use of the phrase "perimeter coating alignment" and incorporates by reference the definitions of perimeter and coating and the entire subject matter of this patent application.

The term "indicia", or similar, as used herein, includes, but is not limited to, any visible substance, including coatings which has defined shape and one or more colors or tones of colors or combinations of material. Examples include such as one color with one metalized coating; any combinations that are possible within the teachings of the present invention such as to at least partially reflect or transmit light from the surface. An indicia may be three dimensional, having different thickness over its surface, may be two or more sided where an indicia occurs in at least a part of the area of one or more sides or surfaces of the structure.

In certain situations, it may be necessary to take unique base constructions, particularly

absorbent papers and to align one or more coatings to a position but then to allow separation of coatings. It is preferable to cut through the applied coatings and a previously applied release coating so as to shear the release coating and the coatings to define a new edge perimeter. This method then facilitates improved waterslide or water or heat transfer techniques.

The term "patterns", "grid", or similar, as used herein, includes, but is not limited to, any one or more configurations of discrete elements, and/or discrete but interlinked elements, one large element or any combination of elements, coating, or pattern. Examples of patterns would be lines, holes of varying shapes, multi-sided shapes, for example squares, octagons and the like, random curved perimeter shapes, patterns combining straight and curved portions, 2 or 3 dimensional shapes, and could combine flat and shaped or formed portions. Patterns may be regular, repetitive, random, symmetrical, asymmetrical , gradiated, variable, and any other design or combination. A pattern may be a singular or a repeating duplicate pattern, or a random pattern or a combination of standard repeating pattern and/or a random pattern when created initially on a base material or when transposed from one or more bases. The pattern would be defined as having one or more edges and combinations of edges and/or different materials which can produce a single or multi layered pattern comprising single or multiple, similar or dissimilar materials to produce a visible result or invisible result detectable by other means.

It is possible to produce patterns on the base with, for example, heat transfer techniques, whereby that part of the coating which is directly in contact with the base will not separate and the base may even be modified to ensure higher bonding strength between the base and the coating in that area, while the other portion of the pattern or portions of the pattern which are applied on top of a heat release coat will transfer under heat and/or pressure to an intermediate or final surface. This makes the production of small, intricate patterns, such as would be useful on see-through surfaces, and more particularly for one way vision applications, to be possible.

The term "permanent", "fixed", "non removable", or similar, as used herein, includes, but is not limited to, a coating which is fixed to a material, or which, after transposition or final location would not be readily removable using normal means. For example, ceramic ink when fused into glass become part of the glass and is not removable by scraping, chemical processing or other traditional means of removing a visible image from the surface of glass. Permanent may also mean an image which is encapsulated within a substance such as glass or plastic, or the like, where the substance is durable and would protect the coating contained therein. Such construction could include laminates of glass, plastics and other materials such that the coating is protected by

outer layers or where the coating is protected by some other form of coverings such as a clear coat or a protective laminate such that the coating is not accessible to external action and may be fused, etched, internal, sealed, subsurface, partially subsurface, or on surface. Permanent may also mean non-erasable, or non-removable, and include the attachment means of one or more coatings to a base or other surface, and includes adhesives so described. This means that a base may have a portion transposed, a portion removed and a portion that is unremovable. Subsequent use of that base means it can be matched to documents produced from the base with an exact perimeter alignment between the two, and the unremovable portion is constant to all.

The term "composite", or similar, as used herein, includes, but is not limited to, an arrangement of more than one material in either the base or in the final material or structure, or of more than one coating or layer, or more than one base with or without coatings, or bases or other surfaces attached together or in close proximity.

The cuts may be made before printing, after printing, stamp cut, rough cut, and may vary the ratio of solid area to open area at the same time. At the same time, it is possible to produce an embossed or cut surface or combine with other materials such as one way mirror film and laminate for UV protection, waterproof sealing or other materials.

Fig. 2A shows a commonly used rotary die cutting machine **53**, containing cylinders **57** which have been fitted with knives or other cutting methods **58** so as to cut though a material economically in unusual patterns. The design of the knife can produce any number of shapes in the base. It is also possible to cut different layers in a base such that you could make four identical bases with a certain shape at the same time for uses which will become apparent in the present invention.

Coatings may be applied using any of the well known methods, such as lithography, offset printing, screen printing, inkjet printing, paint jet printing, hand applied with brush, roller or spray, vapor deposition, metalized surfaces, hot foil stamping, electrostatic transfer, digital printing, or transfer and any past or present technique which allows for the placement of visible and invisible coatings onto one or more surfaces, including onto or in proximity to other coatings.

Coatings which are viscous, flowable or solid at different temperatures and which return from a viscous to a solid state or vice versa upon changing temperatures can be used.

Coatings may be sealed within laminates of other material, or multi-layer laminates with different materials or coatings between different layers that are transparent or opaque or partially one or the other. Whether it be one coating positioned in a precise position once or one coating

repeated on one or more occasion, or one or more combinations of coatings built up on one base or one or more combinations from identical bases or one or more combinations from different bases or whether the coatings are applied or encapsulated in any number of ways, the edge or edges of perimeter coating alignment determine the position and perimeter of one or more coatings.

Coatings may be partially metalized or reflective over some section or sections of the area, such as reflectorized behind the key word of an advertisement or company logo, so as to be reflective under light, under sunlight or artificial light at night.

Some layers may be impervious to certain substances or radiation, may be absorbent to some outside action or may be transmissive to radiation, chemicals, light, and the like.

The term "light passages", "holes", or similar, as used herein, includes, but is not limited to, spaces, air/gas chambers, or cavities where visible light spectrums and other forms of visible and invisible radiation may pass partially or completely through the material, air, gas, or spaces in areas where there is no coating, or may partially pass through areas of coating such as translucent or semi-transparent coatings or materials. . Light passages may have multiple apertures in one section of material or may be one large aperture. Different types of light passages may occur where completely transparent passages are located in proximity to light passages of different transparent capability such as to provide a readable pattern to the eye or on sensing equipment, such as scanners or other measuring equipment. The light passages may also form a pattern, which may also be visible or invisible to the naked eye, but visible to other sensing devices to an identifiable pattern such as a security code or other image which becomes visible only when the density of the light transmission is factored into the "reading" or testing of the surface. Light passages may be made with a complete circumference of perimeter edging or edges may be open at one section or another.

One or more layer or layers which have been previously printed onto a particular base or intermediate base can be transposed in any particular order onto other intermediate bases or directly onto intermediate or final surface material in any particular order, one on top of the other, deliberately aligned, or misaligned, as the case may be, and may also be used, if needed, to encapsulate other materials.

Various adhesives, well known in the art, can be applied to one surface of the coatings for subsequent attachment to a final or intermediate surface or as a transportation means from the base to another surface and then subsequent removal of the adhesive due to the differential surface

contact between the transfer media and the final surface such that the adhesive will separate on the coatings level while the coatings are retained on the final surface. The term "intermediate surface", "transposition media", "media", "secondary base", "transfer tape", or similar, as used herein, includes, but is not limited to, one or more intermediate surfaces to which the coatings are transposed as part of the process. The intermediate surface may be used to reverse the orientation of the coatings during transportation or transposition, or may be used to combine several separately created layers together into one final structure or may be used for storage, transportation or other uses prior to installation on a final surface.

Fig. 3A shows an alternative structure without a solid liner whereby the base **1** was used to apply six additional coatings of any type or duplicates of more than one of the same type **5** whereby two thick coatings were applied above the base followed by four thinner coatings, all of which created a cavity **20** after removal. The cavity **20** could also act as a light passage **28** in certain embodiments or could be retained as a cavity on an intermediate or final surface. The cavity **20** could also be covered with a laminate or other sealing means on one or both sides of the coating construction to form encapsulated compartments.

Fig. 3B shows the construction of a material comprising a series of edges **2**, in this example round holes in a repeating pattern, built as part of a base **1** which has been attached to a solid liner **44**. The holes **20** to create the edges **2** may have been produced in the material by well known art including perforating, punching, die cutting, laser cutting and the like. The use of a solid liner **44** could facilitate handling of the base **1**, containing holes **20**. The purpose of the liner **44** could include holding a vacuum on equipment handling the base for coating, or to add strength to an otherwise flexible or fragile base which would have lost rigidity because of the presence of the holes **20**, or to catch excess coatings from and stop excess coatings transiting the cavities **20** during spraying or application means, or to act as a separating device such that the sidewalls of the holes could be coated deliberately with, for example, metal from vapor deposition, sprayed coatings of liquids, or if the base **1** were of a metal construction , magnetically or electrostatically applied or responsive coatings. The sidewalls of the holes **20** could be deliberately coated in this manner, and then the upper surface of the material could use a portion of the teachings of the present invention to apply coatings to a coating surface **9**. As any sprayed or other applied coatings would also touch the solid liner **44** within the area of the holes **20**, separation of the two structures would mean that the solid liner **44** could carry away any residual coating which was on its surface, and leave the base **1** with coatings on the sidewalls of the holes **20** in addition to precisely aligned

coatings on the upper surface **9**. The structure as shown in Fig. 3A can also be used as a temporary base for repetitive reproduction and transposition of coatings from its surface to an alternative surface, by including release points, coatings, or similar in any location.

Fig. 4 shows a cross section of an inspection port for numerous uses including ovens, heating units, laboratory equipment, autoclaves, furnaces, and many other applications where control of radiated energy, including heat, is required in conjunction with some degree of visibility. The structure **17** has had applied a black coating **75** to which, for example, has been added an insulative layer **252** together with a reflective layer **47**. The observer **89** would see through the direction of observation **86** through the light passage **28** to see the view on the other side of the material. It is equally possible to have the coatings with the same orientation on the opposite side of the material. For reasons of protection of the surface material **17** from radiated heat, it would be normal to have the coatings on the side of the material **17** which faces the heat or radiation source. This would provide better reflectivity of heat energy from layer **47**. The benefit of this structure is that, for example, in a home cooking oven, the reflective coating **47** would be some form of metalized or other reflective surface to "bounce back" radiated heat energy into the cooking area, and thus reduce energy consumption and reduce loss of heat through the surface **17**. It is envisaged that the structure would comprise numerous patterned light passages **28** such as to provide an all over view into the heated area, such as the oven. A partially reflective, yet transmissive coating may also be used as a coating to add to heat reflectivity.

Fig. 4B shows the final result of a see through surface **6**, together with its now attached coatings. These coatings may remain as located or alternatively the see through surface **6** may be further processed via temperatures to fuse the coatings into the surface of the material of the see through surface **6**, such as ceramic ink fused to glass. The coatings may be treatable in some method, such as actinic radiation or heat or other methods to insure improved bonding or adhesion to the surface **6**, or alternatively the coatings may be easily removable from the surface **6** via the exposure of any energy source, radiation, and the like to cause separation between the coatings and the see through surface **6**, to facilitate removal.

Sector control can be used to provide electrical current flow as an example, through different sections of a material such as, for example, a see-through surface where portions of the see- through surface are opaque or transparent, or partially one or the other, as required at any time. The control may be automatic from some form of sensing device. Such as a light sensor, which determines daylight and darkness, or a manual control means such as switching such that

sections of an overall larger surface react according to a pre-designed construction. By using perimeter edge alignment very precise limits to each sector can be obtained, and overlap between one sector and another can be avoided.

A second example of sector control can be a rear window of an automobile, which has sections with defined perimeters where a portion can be heated as a means of removing condensation, ice and snow, or alternatively a particular portion can be made opaque to keep overhead sunlight off the back of passengers in the rear seat.

Another example is see-through surfaces of homes where it is possible to activate sectors of a window such that as the afternoon sun becomes lower in azimuth in the sky, successive sectors of a window can be made opaque, using teachings of this invention and other known methods in the art, such as liquid crystals and polymer coatings so as to provide a sun shield from heat and glare progressively through an afternoon.

In radiation shielding, many uses exist where angles of radiation may wish to be permitted to transmit or restricted from transmission, such that the radiation path is controlled. By limiting the perimeter of one or more sections, it is possible to achieve these objectives. Uses can be made in laboratories, medical facilities and industrial applications, or protection for safety of employees, patients, animals, equipment, furnishings and others.

The term "light transmissive", "light transmission", "transmissive", or similar, as used herein, includes, but is not limited to, the capacity for visible light or invisible light spectrum radiation, for example, infrared light, to be at least partially transmissive from one side of a material to the other or from the exterior to the interior of a structure and the reverse. A coating or layer of coatings may have variations of light transmissiveness from one portion to another portion, or portions, of the material to produce a different light transmissive pattern on the second side. Light transmissive may also refer to invisible spectrum radiation, such as ultrasonic radio frequency, electromagnetic and other forms of invisible radiation which may be transmitted from one side of a coating or coatings to another, or reflect off of a portion of at least one coating, or reflect or refract within or through one or more coatings.

Fig. 5A is an example of a see through surface **6** such as glass **244** as may be used in a building or vehicle, such as the sun roof of a vehicle, whereby the occupants could look out through the sunroof and in daytime observe a scene outside, such as the sun **253**. Currently, sun roofs and other surfaces of vehicles often have a coating on them, and typically a sunroof may have a ceramic frit type ink of one color, which has been screen printed on the glass prior to

tempering or other safety treatment. The reason one color is used is that it is desirable to filter out some of the heat from the sun, and a grid or grating or silhouette pattern, either of dots or holes in the printing, is used to reduce transmitted heat while still providing visibility out through the sunroof. Typically these coatings are black, to improve visibility through the print pattern to the outside. Because it has not been previously possible to provide reliable print registration of such patterns, only one color has been typically used. Although it is possible to obtain some overlay registration of more than one color, particularly in small areas, it is not been reliably produced. The cost of the glass and wastage caused by misregistered printing have made the use of one color the most common technique. Using the teachings of the present invention, indicia such as that shown in Fig. 5B become possible.

Fig. 5B shows an example of four different indicia applied to the example sunroof of Fig. 5A such that indicia **8A, 8B, 8C, 8D** may be different coatings, colors, indicia, logos, background colors, multi colored artwork, logo of the automobile manufacturer, or any other image or identity for any purpose, including color coordination to the color of the car or to graphic treatments of the vehicle, in this example.

By creating a pattern on the back windows or other windows of motor vehicles and incorporating a coating of metalized material, such as by vapor deposition, it would be possible to have a substantial area of a window evenly heated from a layer embedded in the coatings. From the inside of the vehicle, you would see between the black coatings through the light passage and from the outside there could be one or more colors including a decorative image. Between the coating layers and in the layer in close proximity to the window would be a metal conductive surface or a series of partial surfaces on one or more electrical circuits, connected to an electrical source to generate heat, which is conducted to the glass for the heating of the glass to remove ice, snow, condensation, water vapor and the like. The same structure could be used on see-through surfaces of buildings, such as glass atriums in offices, restaurants, homes and the like.

Automotive vehicles, including rear windows, side windows, sunroofs, striping or sections across windshields, and for camouflage for glass on military vehicles, can incorporate thermochromic inks that can change color with heat or electrical current. On any application such as offices, homes and any other surface, either see through or not see through, an image or wall mural can be printed in sections to change color with perfect alignment of the colors underneath the top layer.

Fig. 5C shows indicia **8A** which is a perimeter treatment of one or more colors, a gradiated

indicia **8B** whereby the degree of sun protection across the top of, for example, a windscreen or windshield of a vehicle, or other see through surface **6** uses, such as buildings, would permit reduction of the glare from the sun while still permitting visibility out from the inside. Indicia **8C** can be the identity of the automobile manufacturer, or any other visual indicia including color treatments, logos, or any other visible form of coating. The remainder of the window glass **244** may be uncoated, and therefore the perimeter **3** of and between indicia **8A**, **8B,** and **8C** are in alignment with no misregistration faults, even when indicia is multi color within the areas of indicia **8A, 8B,** and **8C**.

Fig. 5D shows the view through the see through surface **6** of Fig. 5C such that an observer inside the vehicle may see view **87** of the outside world, in this example a tree. The dotted lines in Fig. 5D are there to indicate a location of the indicia shown in Fig. 5C although a viewer on the inside would see through that indicia, using light passages, the constructions of which are taught herein and the uses for which are well known in the art. To provide a multi colored image on glass, such as vehicle windows, it is possible to print multiple layers of ceramic ink in any order, such as for one way vision or other uses, or as substantially opaque coatings whereby each of the coatings are applied in turn. This means that from the inside of the vehicle, you would see the coating intended to face in that direction, whilst from the outside of the vehicle you would see an entirely different coating, and the perimeter of these multiple coatings would be in perfect alignment if the transfer paper technique, as taught herein, were used and where the shape of the edge of the coating was cut after the coatings were applied so as to create a precise edge. Alternatively, if the edge of the transfer material had a release coat, then the coatings could be applied on the coating surface, and subsequently release to be applied to the glass using any technique. Usually, ceramic frit type inks are used in this application to provide durability on tempered glass - however, other coatings are usable. The same technique could be used to print a band of at least partially opaque coatings on see through surfaces to restrict angles of sunlight.

Fig. 6 shows an example of a multi layer or multi coating structure which could have been manufactured in numerous ways, such as where the coatings were applied on a base, were then transpositioned to the solid liner **44** for handling and relocation. Fig. 6 also shows a transparent laminate **45** being moved into contact with the surface of the multi layer coatings in the direction of movement **66**. The coating construction comprises at least one light passage **28**. An example of coating orientation, for a specific purpose, is where coating **40** may be an adhesive coating which will separate from the releasable solid liner **44** for subsequent transposition to another

surface, such as a see through surface. Mono or multi colored indicia **77** has been applied on top of the adhesive liner followed by a white coating **76** and a monochromic or black coating **75**. It is equally possible that the black coating may be placed against the base, and the coatings build up in reverse order with the adhesive **40** and solid liner **44** being a combined structure which has been prepared from the same base. Other coatings such as a coating **65** may be applied for any purpose and, for example, may be an opaque white coating, a transparent coating, or a reactive coating, and other coatings may be further applied such as a reflective coating **83**, a vapor deposited coating of any thickness including partially transmissive and partially opaque coatings. It is possible to have numerous combinations of coatings placed in any order on any one or more levels of a structure of a base, such that the possible combinations are too numerous to teach individually in this present application.

To produce a material with a defined edge or edges with one or more colors in exact registration for ceramic frit ink transfer to glass, the steps are:

1. Prepare the base with the desired pattern, for example, the pattern could be a band for use across a car windshield, a pattern comprising a plurality of intended light passages such as round holes in a staggered pattern, parallel stripes or any other shape or shapes. The base may be produced by cutting, perforating, removal of a portion of an original coating, and the like. The preferred embodiment is to have a pre-coated paper with a release coat. The coatings are then applied to the base.
2. For water transfer, the paper, together with it's coatings, would be soaked in water and then the coatings could either use the waterslide technique to be transferred to the see through surface, in this case, glass, or using the water transfer technique, may be applied against the surface of the glass, and the base, in this case, paper, would be removed by peeling back or sliding it from the surface of the coatings.
3. When the water transfer inks with their cover coats have been reasonably dried, the glass, together with cover coatings now attached would be placed in a tempering furnace, also known as a toughening or tempering oven, and processed in the normal way, to fuse the ceramic ink coatings into the glass.
4. Upon removal from the tempering furnace, the image has now become fused into the glass and is permanent. It is possible to fuse the ceramic inks into the glass and is permanent. It is possible to fuse the ceramic inks into the glass without tempering the glass, but it is assumed in many applications it would be normal to do both functions at once.

Fig. 7A shows a perspective view of a construction whereby a solid liner **44** has been located behind a base **1**. As an example, base **1** may be a paper of a water strength type used for production of and transfer of ceramic inks and other inks to glass, coatings, plastic, or ceramic surfaces. Papers known as water slide or water transfer have been used in the ceramics industry for many years. By processing the paper in the teachings of the present invention, so as to create a series of perimeter edges, it is possible to produce a construction, as an example of configuration, as shown in Fig. 7A. Holes **31,** being round and in a staggered pattern, provide approximately 50% of the surface area as coating surface **9** and the remaining 50% of the surface as light passages **28**. The liner **44** may remain with the base **1**, or be easily removed or separated before or after coating or imaging.

Fig. 7B shows a base **1** a cross section through the joined materials of the liner **44** and the base **1** or may alternatively be a prepared base **1** with some form of release coating suitable for this type of process. As examples of the numerous coating combinations which are available, there could be a black coating **75** applied to release coatings on the paper base **1**, followed by a white coating **76** and one or more indicia or colored coating **77**. For water slide transfer, a cover coat, such as an organic coat **80**, may be applied on top of the material. If the coatings **5** were of ceramic frit or ceramic ink type constructions, then it is normal in this well known process to have the ceramic ink in intimate contact with the glass surface prior to firing, tempering, or fusing. The coatings may be oriented in any particular order, according to the visual results required on the glass or for water transfer or other direct transfer methods. The image and indicia may be printed in reverse or mirror image, and additional coatings applied as required such that after transfer, the orientation of the image on a particular side of a piece of glass reads correctly. As an alternative embodiment, it is also possible to construct the coatings in any combination, and to create the edges with precise cutting methods such as laser, die cutting, or other mechanical known methods in the art, in any pattern whatsoever, including holes, stripes, and other irregular patterns, such as to cut through coatings **5** which may be of differential type, thickness, or viscosity, after drying of the coatings and prior to the transfer step. If a paper is used as the base, it is known that paper is absorbent, and that the cover coat commonly used in this well known process may be absorbed into the paper, and not provide adequate release. It is also possible to print the coatings on a suitable base, and to transposition the coatings from a non porous base, as an example, to a coated paper known as waterslide or simplex paper whereby the coatings made on the base do not penetrate the coatings previously applied to the waterslide papers and thus do not bind to the paper

fibers, and thereby are not restrained in their transposition via waterslide or water transfer to a glass or other material. When transposition is being used, the coatings would be selected and images orientated according to the steps to produce the correct orientation of image on the finished product. As an alternative example, it is possible to produce paper bases with perimeter edges which may then be oversprayed or separately coated with release coatings to seal the paper fibers, to prevent the paper from coming into direct contact with one or more of the coatings.

Fig. 7C shows the example construction **1** of Fig. 7B being soaked in water **41** as a well known step, to prepare for release of the coatings from the base paper.

Fig. 7D shows the known technique of water slide, whereby the paper base **1** is being removed from under the multi layer coatings **5** in the direction **66**, and any residual water **41** is being left in the holes **31** and may be squeegeed out or evaporated out prior to firing or tempering. The ceramic ink structure has then been transferred to the surface **17** of a sheet or pane of glass **6** to form a see through surface such that when the water **41** evaporates out of the holes **31**, the holes **31** will become light passages **28** in the coatings **5** on the surface **17** of the glass **6**. This technique is known in the industry as "water slide transfer", and the teachings of the present invention offer enormous advantages over the current art. The holes in the material provide numerous print edges in this series of figures, but the perimeter of the coating area may be any shape and for any purpose. Areas of the coatings where print is not required can become open areas in the coatings, whether or not the purpose of the process is to create a one way vision or two way vision effect, or not, such that water evaporates readily from large areas of material via the holes, and does not get trapped under the surface of the coatings. Water, air, and other substances trapped under coating layers can expand as rapidly when the glass is being fired, fused, or tempered, and cause damage to the coatings and/or reduce their fusion and adhesion qualities into or onto the surface of the glass. If hole patterns are not the desired choice, but a pattern comprises a large solid area, then perimeter printing can still be used to orient the coatings to the edge and the perimeter may be made by having an existing perimeter on the base, or alternatively creating a base via other means such as cutting or using more than one level to only permit the required portion of the coatings to come into direct contact with the glass as part of the steps prior to tempering, fusing, or firing, such that the ink or other coatings may form a defined edge. Uses would include printing coatings around the exterior portions of vehicle windows, and many other uses.

Fig. 7E shows a processing step well known in the art called tempering or furnace firing which is commonly used to fuse ceramic ink into glass, with the improvement of the ink which

had previously been transposed in the teachings of the step in Fig. 7D or as shown in Fig. 7F and 7G such that water which would have been present in the water slide technique shown in Fig. 7D will evaporate through the holes **31** in the coatings, and thereby solve a problem inherent in the prior art. The heating sources **91** produce heat which causes fusion and in tempering ovens, also acts as a tempering or toughening procedure, well known in the art, for tempering glass. The holes **31** or other cavities in the inks provide a release area for water to be removed from the surface, or from within the perimeter edge of the coatings to evaporate off as steam **41**. This evaporation aids in providing large expansive areas of coatings and permits improved adhesion between the coatings and the glass surface, which generally require to be in intimate contact with each other to aid this process. This is an improved embodiment of the techniques of the known prior art, and provides for a one way or two way vision result, if needed. Large areas of glass may require the use of multiple adjoining transfers because glass can be made in sizes larger than popular printing press sizes.

When the present invention is used on see through surfaces, and where partial visibility is obtained from one side, regardless of the coatings on the other surface, true renderings of color are available to the viewer assuming the see through surface itself is generally color free. For example, there has been a fashion for providing reflectorized windows for buildings as a means of reducing radiated heat from the sun and therefore to save on air conditioning costs. The tinted glass and/or reflective type treatments also provided a degree of privacy for the occupants of the building regardless of the wish to control heat from the sun.

By using the present invention, it is possible for the occupants to see between the areas of print regardless of the pattern chosen for these transparent portions and to enjoy the correct color of the outside world and not having that color affected by the tinted window or tint film added to clear windows or combinations like that. From the outside, it is possible that the building may still look reflectorized because a reflectorized coating can be used in the coatings. A color or colors can be used to allow an architect or builder to coordinate the color of the glass to the color of the building, or any other treatments, such as the company's logo which could be printed on the exteriorly visible side of the glass while the occupants see through it and are totally unaware of the existence of their companies logo on the outside of the window. This could be used in high rise city office buildings, hotels, or any other type of building whatsoever.

The same concept can be used on vehicles, such as company vehicles, shuttle buses, public transport buses, where advertising or corporate identity or any other visual and/or energy control

message is desirable.

Real color can now be visible from one side while the viewer sees through the see- through surface to the area on the other side of the glass or see-through surface such that the colors rendered to the eye are natural and visually correct.

Fig. 7F shows a heat and/or pressure transfer method for coatings whereby a base **1** which may have holes **20** , indicia **8** on a coating surface **9** is being fed through rollers **57** such that an intermediate or final surface **17** will receive the indicia via transfer techniques, where such techniques are themselves well known in the art, but the use of a unique base **1** provides for the creation of a unique image or indicia **8** on intermediate or final surface **17.** It is common in such methods that the transfer or transposition of coatings from the base to the other surface is conducted via either heat, pressure, contact, or combinations of these, but also may be accomplished by other methods such as magnetic attraction and repulsion from one surface to the other, or electrostatic attraction or repulsion, or with coatings which are reactive from the base to the intermediate or final surface such that upon close proximity or contact they have chemical reactions that cause transposition of the coatings, and many other methods. After transposition, the indicia **8** is now visible on the intermediate surface **17** and it is possible in this example that the reverse image visible on the intermediate surface **17** could then be transposed to another surface be it a base or final surface, such that the print orientation becomes correct. The use of holes **20** causes the creation of light passages in the printing and in the indicia **8** on the surface of the material **17**. The direction of movement **66** is to allow the rollers **57** to perform the transfer function of this example.

Fig. 7G shows a prepared base **1** comprising indicia **8** coated so as to leave light passages **28**, formed by the edges **2**, ready for transposition to the surface **17** of a see through surface **6**, such as glass. The coatings and indicia **8** may be prepared with some form of adhesive or other means to temporarily or permanently attach the indicia **8** to the surface **17** after bringing the base **1** in the direction of movement **66** so as to place the two materials in intimate contact. After transposition, the base **1** would normally be removed and either reused or discarded. Alternatively, base **1** may be itself an intermediate or final surface, such as a film of transparent or other structure, and may be adhesively or otherwise fixed to the see through surface **6** so as to remain temporarily, semi permanently, or permanently in place. The term "semi-permanent", or similar, as used herein, includes, but is not limited to, coatings which remain fixed in normal use but which can be relocated by transposition, or removed with special cleaners, scraping action, mechanical removal,

removal by the application of heat or cold to cause dissolving or release of the coating, radiation, heat, or other means of causing the removal of the coating whether done by liquid, powders, air abrasion, water jet, chemical, light beams (such as laser) or radiated sound waves, such as ultrasonic and the like, and includes adhesives so described. Base **1**, after transposition to the window, may become a surface to which overcoatings may subsequently be applied or to which other substrates or materials may be applied, assuming base **1** was made from a master or whereby base **1** was reused to reprint additional coatings of the same configuration and the same light passages **28** to provide multi coating capability on the surface **17** of the see through surface **6**.

Fig. 7H shows a base **1** prepared with light passages **28** comprising edges **2** to all the light passages, and an indicia **8** over the remaining surface of the material. It is possible that an identical repeating pattern is placed over the entire base area or over a portion of the area, or to have different patterns on different portions of the base according to the required design. Assuming the base and its indicia included a coating such as adhesive to permit attachment to the surface, then the step of transposition would make that occur. Alternatively heat, pressure, or other means may be used to ensure attachment of the indicia **8** coatings, and other coatings which may be beneath the indicia or not easily visible. It is possible for a second indicia to be in direct contact with the base **1**, and this indicia, which is currently not visible in Fig. 7H, would become visible on the upper surface after the transposition step to the surface of the glass.

Fig. 8A shows an alternative method of transfer which can either be a direct transfer using adhesive, or other methods known in the art or disclosed in the present application, or may be a continuation of the steps shown in Figs. 7A, 7B, and 7C, whereby the base **1** has, together with its coatings, and holes **31**, been brought into contact with a surface **17**, such as glass, such that the coatings are in intimate contact with the glass surface and the base **1** is being removed in the direction **66** to leave the indicia **8** on the surface **17**.

Fig. 8B shows a similar process to Fig. 8A but the base **1** is being removed in direction **66** after transposition of indicia "A" and other visual images **8** onto the surface **17** of a material. The images were formed on paralleled striped ridges **67**, in this example so as to provide a partial coverage of image on the surface **17**. There are many uses for this technique including one way vision, combinations with previously or subsequently applied coatings, for energy or light control or to form air or gas cavities between the coating areas when the coatings are brought into intimate contact with a solid surface.

It is one purpose of this embodiment to produce a new and unique product which provides

effective one way vision without the inherent cost and problems of the existing art.

The present invention provides for the ability to manufacture a varying relationship between the area of printed image on the front surface of the invention and the area of light passages available for viewing through the material from the opposite side. Also, the coatings adhere well to a see-through surface because the preferred process has a continuous material surface and yet enjoys superior optics and far reduces processing, without mis-registration of the coatings.

For interior mount construction, or for transposition, the base would be first printed with a black or substantially dark monochromic coating, and for print reasons this would normally be covered with a white coating to provide a suitable background for the multi-color coatings, then one or more colors of image are applied prior to cutting and transposition. This means that when attached to a see-through surface the viewer would see through the light passages between the areas which appear black to the viewer. From the opposite side, typically the outside of the see-through surface, the viewer would see the colored image on the front and enjoy the phenomenon of having very minimal view through the material, particularly when the exterior light is brighter than the light behind the image.

For exterior mount construction, or for transposition, the construction would be a reverse printed one or more colored image, next would be applied a white color to provide a background for the colored image, next would be applied an opaque black coating. The material would be attached to the inside of the see-through surface and the viewer would look from the black side and see through the light passages to see the view outside the see-through surface. From outside the see-through surface, the viewers optics would be through the glass, through the adhesive, if present, to see the colored inks which were printed onto the surface in reverse image at the time of printing.

The preferred embodiment is for a continuously interconnected image using light passages of a circular nature at a staggered pattern whereby approximately 50% of the material is light passage and about 50% is image area.

Printing on both sides of the material prior to installation or printing images back to back on one side of the material or base provides the capability for people on one side of the material to see one image and people on the other side of the material to see the same or a different image according to requirements.

One or two way see-through vision is possible and may also be achieved on multi-sided

material, such as formed material, prisms, lenticular structures, parallel sided structures, structures where one side is flat and the other is simple or compound curved, parallel sided in a curved manner like a car windshield. A see-through surface need not be tinted or coated.

As black is light absorbent, varying the darkness or lightness of the black color will affect visibility. A paler color of black, such as charcoal or light gray, and containing greater amounts of white added to the black color would make it more difficult to see through that portion, therefore entire areas can be used with different colors of black or alternatively, through print coating control, it would be possible to have some sections as dark a black as possible while other sections are either paler black, or, may even be colored through the spectrum of colors to white, thereby making vision from that side variable from one section to another or from one part of a surface to another, or from one surface to another surface.

The lower level of the transparent material is intended to become the light passages through which the viewer from the interior, or rear side of the structure, sees through the material.

A see through surface could have one side coated with light reflective material either for mirroring or for projection of an image, such as a movie, onto it while still retaining visibility through it from the inside, the uses of such structures being well known in the art.

Fig. 9A is a cross section base of a structure comprising a base **1**, which had edges formed via having holes **31** made in the base **1** and an adhesive layer **40A** which also has holes in the adhesive, where it is usual for the holes **31** to have been manufactured through both materials at one time or for the adhesive to be coated later, both steps being known in the art. On the other side of the base has been applied a series of successive coatings aligned on the edge **2** so as to cause a perimeter **3**. The coatings in order from the base in this example were: a black coating **75** coated in a pattern different to the position of the holes **31**, so as not to cover the complete surface. With this improvement, it is possible to define boundaries to which further coatings may be applied using the black **75** coating, as an example, as a secondary base level and thus produce a graduated or differential effect for see through vision such that if the base **1** becomes an intermediate or final surface and is transparent, then the next color applied, in this example white **76**, would be visible in areas not covered by the black and if this step was repeated, it is possible that from one side black will be visible where coated, white will be visible where coated and not visible when coated on top of black, and a color **77** would be visible where neither of the two previous colors were coated, but would not be visible when coated on top of either black **75** or white **76.** If a release point existed between base **1** and the example black coating **75,** then individual dots would be

transpositioned across as part of the transposition teachings, optionally on top of the image coating **77,** an adhesive **40B** was further applied. The adhesive layer **40B** may be covered with a release liner known in the art to facilitate transportation to a transposition site. Alternatively, the adhesive **40B** may be used as a means to facilitate attachment of a solid laminate **45** which would then cause the light passages **28** to become encapsulated on that side and after transposition, the adhesive **40A** could be brought into contact with a see through surface such as a window, so that the air or gas contained in the light passages **28** is captured between the window and the laminate **45.** Alternatively, the structure shown as the laminate **45** could be the previously mentioned release liner, or other materials, or even a second or more bases as part of a construction to build up multiple layers.

Fig. 10A shows a three layer construction of coatings which have been transposed to a see through surface **6**. In order of attachment, the coatings were: black **75**, white **76**, and a colored image **77**. It is possible that the colored image **77** may be a monochrome color, such as a blue or any other color, and it is also possible that certain portions of the image may be one color while certain portions of the overall image may be a different color and that certain portions may be multi color within each segment. Additionally, the use of the third coating **77** may not be necessary if it is desirable, for example, to have a white color **76** as the visible color. In this example, an observer **89A** to the left of the see through surface would see the image **77**, whilst an observer **89B** on the right hand side of the material would readily see through the see through surface **6** and through the light passage **28** created between the sections of coatings, such as to observe the view on the side of the window opposite to the observer **89B**. This is a typical construction for one way vision products, and yet provides the benefit of having aligned coatings, without needed to use the photo stencil process or other prior art. The one way vision effect is well known, but this method of preparation provides substantial benefits including the use of construction and transposition in alignment, particularly in large areas. The coatings are not to scale as shown relative to the window **6**, but are intended to define coatings as separate structures. It is also possible that some of these coatings may be intermixed from other coatings, that they may be removable at one point in the coating layers and not separable at another junction point of two coatings, and many other possibilities.

Surfaces of buildings and vehicles including rear windows, side windows, sunroofs, striping or sections across windshields, camouflage for glass on military vehicles can incorporate inks that can change color with heat or electrical current on any application and on any surface,

either see through or not see through. An example could be a wall or window mural printed in sections to change color with perfect alignment of the colors underneath the top layer.

In Fig. 10B, we see a similar construction to Fig. 10A except that an adhesive **40** has been used as the attachment method. The preferred adhesive may be of a permanent type or removable or temporary, according to the intended application of the mono or multi coated layers. Fig 10C shows a double sided image attached to a see through surface **6** whereby the adhesive **40** has been chosen as the attachment means, and the coating layers may have been built up in either order. For example, the base may have initially had applied an indicia coating **77B**. It is possible that the adhesive **40** was first applied to the base, not shown, and the other coatings were built up on top of that initial coating. In that case, it would be necessary to have a transfer tape or application tape, the use of which is well known in the printing and graphic arts, as a transfer medium such as to release the adhesive **40** from the original base to expose it ready for application to the see through surface **6**. Referencing from the adhesive **40**, a clear coat **26** is applied next to an indicia coat **77A** such that the indicia is visible from the left hand side of the example shown in Fig. 10C. The white coating **76** is intended to provide a white background to the color coat **77A** to provide realistic colors. The black coat **75** is intended to act as a block out, such that no light will transmit from one image through to the other, and this would in turn necessitate the addition of a white coat **76B** before applying the color image coat **77B**. As an alternative, it would be possible to use metalized film or other opaque material, and this technique of light block out is well known in the art. However, the present invention provides for many such complex structures and options of coating selection, while still retaining edge registered layers for purposes such as this example.

Fig. 10D shows a construction commonly found in automotive windows whereby a material **59**, typically PVB, has been laminated between two sheets of glass **6**, well known in the art, particularly for automobile windows. To one side of one surface of one of the two sheets of glass **6** has been applied a black coating **75** , together with a white coating **76** and an image coating **77**, such that an observer **89A** will see the colored image **77**, whilst an observer **89B** will look through the transparent structure and through the light passage **28** to the view on the opposite side of the see through surface. Coatings may also be encapsulated between two or more layers of a see-through material or surface, such as a window.

Fig. 10E teaches a similar construction using the same image orientation as Fig. 10D, but with the coatings **75, 76, 77** applied to the opposite side of the window, such that an observer **89A** sees through the see through surface, through a transparent adhesive **40** to the indicia **77**. An

observer **89B** looks through the light passages **28** and through the see through surface **6** such as the glass laminate, to the view on the opposite side.

A reversible panel or panels for any of the embodiments or examples including heat, light, sound, glare or combinations thereof, may be rotated to allow transmission of any of the above from one side to the other, for example, reflect sunlight in daylight, allow absorption of heat in early morning or late afternoon, to allow views in one direction by day and views in the opposite direction by night. A structure may be rotated on a mechanical mechanism or rotation may be simulated in effect by having changeable coatings via electric current or other means such that the characteristics change to permit light in one situation and to prevent transmission or partial transmission of light in other situations. The same structures may also provide control of heat, glare, sound, and other uses.

Fig. 11A shows application options which include using transparent bases **6A, 6B,** which have been manufactured with edges **2** to determine perimeter walls **3**, to cause alignment of coatings in a required pattern. The construction from left to right shows coatings applied to a see through base **6A** which has been applied with an adhesive **40** to a see through surface **6** which is a window. The second base **6B** has been applied by an alternative process such as electrostatic cling attachment, heat transfer, or other methods of attaching the base **6B** to the see through surface **6.** Typically, the see through surfaces may be glass or plastic, according to the required installation or combination of any materials. An observer **89A** will see a complete image which has been manufactured such that a combined image made up of two halves, in this example, or two portions of unequal relationship, such that a portion of the image is located in the coating **77A** and the remaining portion of the image is in the coating **77B**. When viewed from a position **89A** the viewer does not see through to the opposite side of the see through surface **6, 6A, 6B**, but sees a complete image made up from two halves, which were independently produced using bases of compatible size and configuration. This means that the observer **89A** sees a complete image, and is not conscious of the existence of the see through surface or of the observer **89B**, or any other view on the other side. Alternatively, observer **89B** may, because of light absorption of the black coating **75A** and **75B**, have angular visibility through the see through surfaces **6, 6A, 6B,** and the joining adhesive **40**, so as to allow visibility through the entire structure at certain angles to the opposite side. This will prove useful in many applications including security situations where it is desirable that the observer **89A** is not conscious of surveillance from observer **89B**. The use of combined coatings on opposite sides of a see through surface are well known in the art, but it has

hitherto been almost impossible to create regular and precise alignment due to minor irregularities in printing. Even when using the photo stencil process from a common artwork, it is not possible to regularly precisely align two separate substrates with the same pattern. This is due to variations in screen stretchability if screen printing is used, or various temperature differentials from one day to the next, all of which cause small movements in the positioning of the required pattern, such as a silhouette pattern. Therefore using the teachings of the present invention, it is now possible to precisely produce matched bases, or to use a common base as a transposition means to other materials, such as transparent films, to produce the unique processes and products as taught in this embodiment.

Fig. 11B shows another embodiment of the constructions possible with the present invention such that observer **89A** can view a complete image that was produced separately in two portions comprised of image **77AA** and **77AB** such that the observer does not see through to the opposite side of the see through surfaces, but sees the complete image made up of two or more portions. It is also apparent that the see through material **6A** and **6B** which was attached to either side of the see through surface **6**, typically a window, could act as bases such that the coatings were applied in register to each other on the glass or window surface **6** and that the see through surfaces **6A** and **6B** were not required on either or both sides of the see through surface **6**. This would be readily accomplished using the teachings of the present invention, or combinations thereof. Observer **89B** could selectively view the opposite side of the window at certain angles which are controlled by the relevant positioning of the coatings, with or without the base or bases on both sides of the window. Observer **89C** would see a complete image, which would be composed of coating **77BA** and **77BB.** The images comprised of **77AA** and **77AB** may produce an image which is identical to or quite different from the image comprised of coating **77BA** and **77BB.** In addition, any of the illustrated figures could incorporate the control of energy or radiated heat from the sun or lighting control by the selection of and positioning of coatings on one or both sides of a surface, with or without images.

Fig. 11C shows a combination of two see through surfaces **6** attached together as either a lamination step or with adhesive **10** and in this example, both the see through surfaces **6** may have been transparent bases which were subsequently bonded together with the adhesive or other bonding means **10** such that the perimeters **3** created an edge **2**, and permitted the addition of black coating **75**, a white coating **76**, and a color coating **77A** and **77B** to produce one way vision indicia. The coatings to the left and right of the joining material **10**, are in reverse orientation such

that the image **77A** may be different to the image **77B**, or alternatively both images may be identical and yet the material still retains numerous light passages **28** to allow one or two way visibility according to the light levels. The effect of changing these light levels is known to have been used since the early part of this century or earlier to differentiate two sided materials with indicia in different light conditions.

Fig. 11D shows a structure comprising a see through surface **6**, such as glass, which has had material **6A** and **6B** respectively attached to opposite sides of the see through surface **6** using an attachment means such as an adhesive **40**. It is assumed that the see through material **6A** and **6B** may have had images transposed to them or may have been a base as taught in the present invention, whereby coatings which are black **75**, white **76**, and indicia or color images **77** have been respectively applied on the edges **2** of the materials **6A** and **6B** respectively. In this example, visibility is also possible through both sides of the material, but it is possible that either material **6A** and/or **6B** may be individually or separately removable, or both may be removed from the window **244** sometime in the future if a removable style attachment means **10** was selected. This makes it possible that if one material such as **6A** was removed first, then the one way visibility would be easily facilitated from the left to the right side. If, however, material **6A** remained in place and material **6B** were removed, then one way visibility would be more easily facilitated from the right side whilst the image **77** would be more visible from the left side. Obviously, many other combinations of results may be obtained including the changing of one side of the material to change its image or alternatively to replace one side of the surface with another image that may line up an combine to produce a complete indicia from one or both directions, such as the example is taught in Fig. 11A or 11B.

Fig. 11E teaches the use of multiple coatings applied to one side of a see through surface **6** and a black monochromic coating **75** positioned on the opposite side, in a particular location, such that an observer **89** would not see through the black coating **75** but, in this example, would be able to see upwards and downwards at angles determined by the geometry of the coating thicknesses on one side, the thickness of the see through surface **6**, and the size, positioning, and thickness of both the black coating **75**, and the coatings **26, 75, 76, 77** on the opposite side.

Fig. 11F shows a similar construction to Fig. 11E but where the position of the black coating **75** has been positioned to prevent horizontal visibility through the light passages **28**, but permits visibility at an upward angle in this example, but prohibits visibility at a certain downward angle. The angles are determined in accordance with teachings described in Fig. 11E.

It should be apparent to one versed in the art that a coating applied to see-through surfaces for the purpose of vision control would also provide a reduction in energy transmission through the see-through surface such as heat radiated from the sun or heat or cold conduced through the surface of the material or reflected from the surface of the material. The use of a decorative image would also affect the reflect the reflectivity of heat and also reflect or reduce the amount of transmission of light under different embodiments of the present invention.

By creating an internally reflective surface, or a light reflective thin film coating on the side of the light chamber opposite to the side of the coatings, it is possible that when the light is illuminated, it is not possible for persons on the coating side to see through because of the reflective coating combined with the reflected light coming from the reflective surface on the side opposite the coating side. Various combinations thereof including partial coatings, partially covered coatings, dual sided coatings, edge coatings, perimeter illumination or multiple sections of illumination, to contain the light within the light chamber area, together with the light source, may be used to create certain effects.

The application of a mirrored film, which is partially transparent, but mostly reflective from one side and partially transmissive from the other, would also enhance this effect. Light chambers could be applied for coating or after coating or between other structures to which the light chamber construction is applied.

It should be understood that various modifications within the scope of this invention can be made by one of ordinary skill in the art without departing from the spirit thereof. I/We therefore wish my/our invention to be defined by the scope of the appended claims as broadly as the prior art will permit, and in view of the specification if need be.

What is claimed is:

CLAIMS

1. A method of forming a pattern of color coatings onto a see-through panel with exact registration between successive color coatings of the pattern, the method comprising the steps of:

a) providing a base material having an ink printable release coating on one side thereof;

b) applying a first color coating to the printable release coating side of said base material;

c) applying at least one additional color coating over at least a portion of said first color coating;

d) perforating said base material with said color coatings to provide a pattern of light passages therethrough, said light passages defining aligned edges of successive color coatings to ensure exact registration between said successive color coatings; and

e) transferring said pattern of color coatings onto a surface of a see through-panel.

2. The method according to claim 1 which includes the step of heating said see-through panel to fuse said pattern of color coatings onto said surface of said see-through panel.

3. The method according to claim 2 wherein:

a) said base material comprises water slide paper; and

b) said step of transferring said pattern of color coatings includes wetting said base material to release said pattern of applied color coatings of ceramic ink therefrom for water slide transfer to said see-through panel.

4. The method according to claim 1 wherein:

a) said base material comprises heat transfer paper:

b) said step of transferring said pattern of color coatings includes applying pressure and heat to said membrane to release said pattern of applied color coatings therefrom.

5. A method of forming a pattern of at least one color coating onto a see-through panel, the method comprising the steps of

a) providing a base material capable of temporarily retaining a coating;

b) applying at least one color coating to at least a portion of one side of said base

material;

c) creating at least one edge through at least one color coating and through at least a portion of the base material;

d) removing at least a portion of the coated material to define an edge; and

e) transferring said coating onto another surface.

6. The method according to claim 5 wherein:

a) said color coating is transferred to a see-through panel; and

b) said see-through panel together with one or more coatings in close proximity to the surface of said see-through panel are heated.

7. The method according to any of the preceding claims, wherein at lease one of said coatings is a metalized material.

8. The method according to any of the preceding claims, wherein at lease one of said coatings is a ceramic ink.

9. The method according to any of the preceding claims, wherein at lease one of said coatings is a dark colored coating.

10. The method according to any of the preceding claims, wherein at lease one of said coatings is enamel.

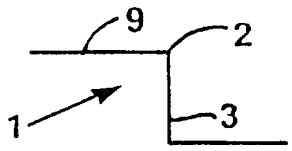

FIG.1A

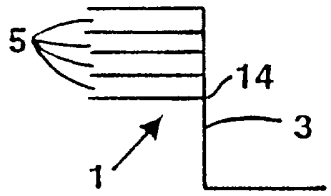

FIG.1B

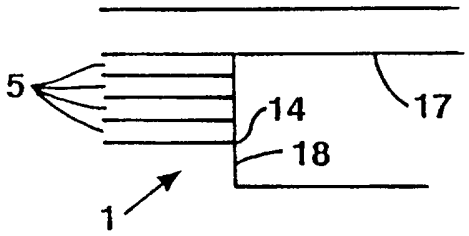

FIG.1C

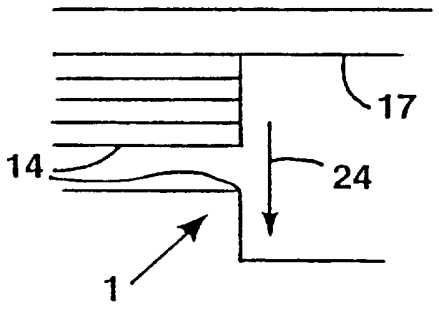

FIG.1D

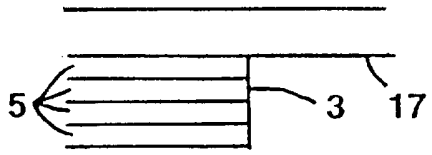

FIG.1E

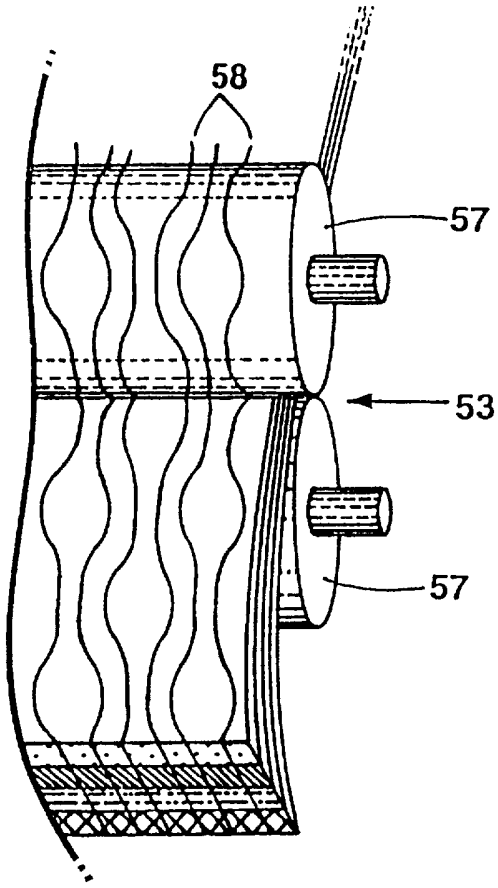

FIG.2A

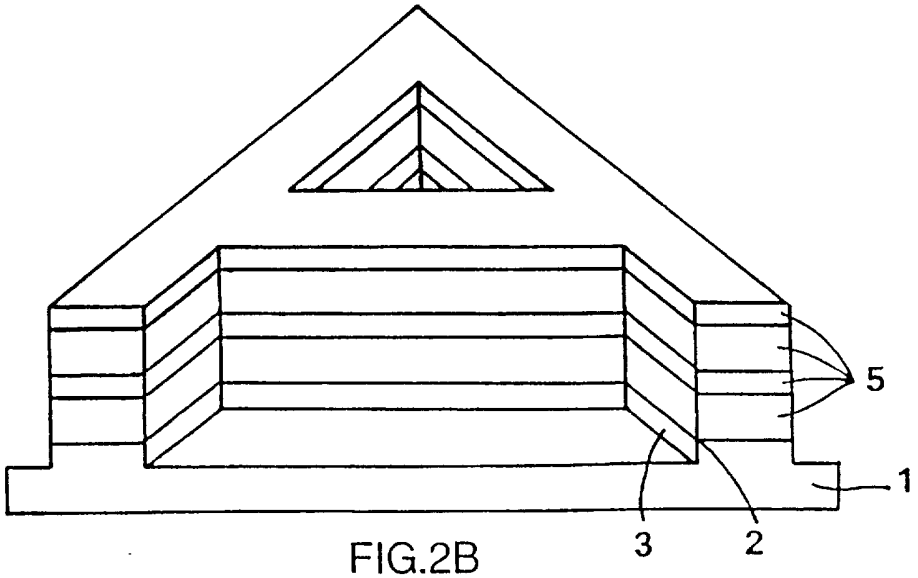

FIG.2B

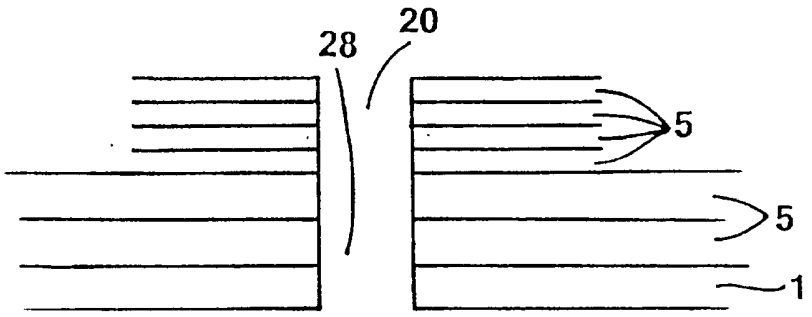

FIG.3A

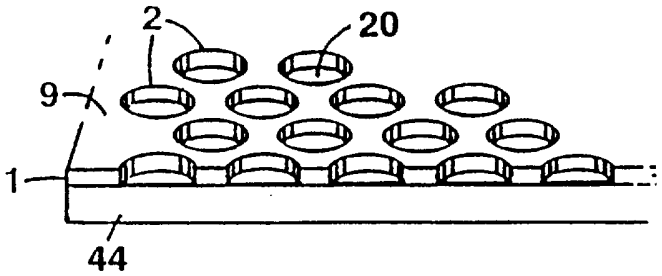

FIG.3B

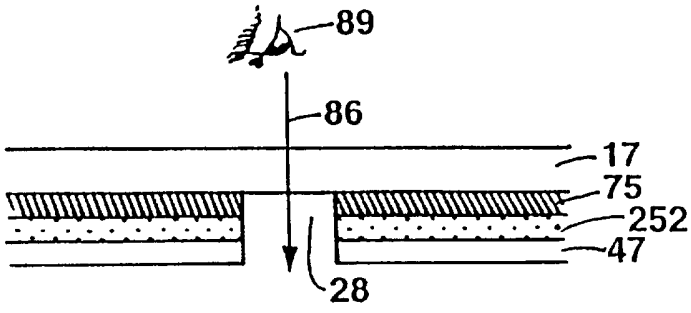

FIG.4A

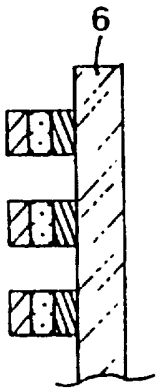

FIG.4B

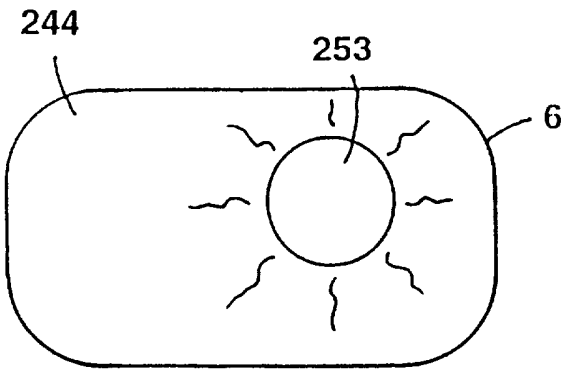

FIG.5A

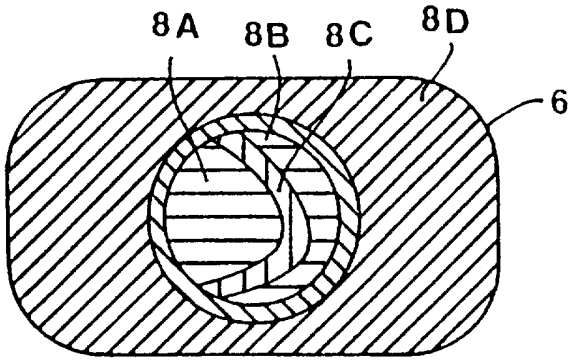

FIG.5B

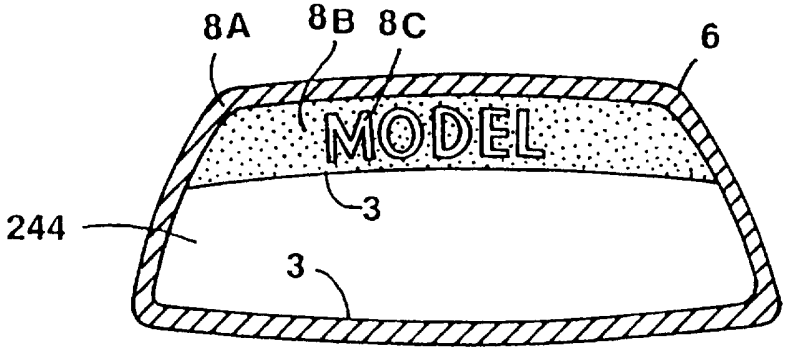

FIG.5C

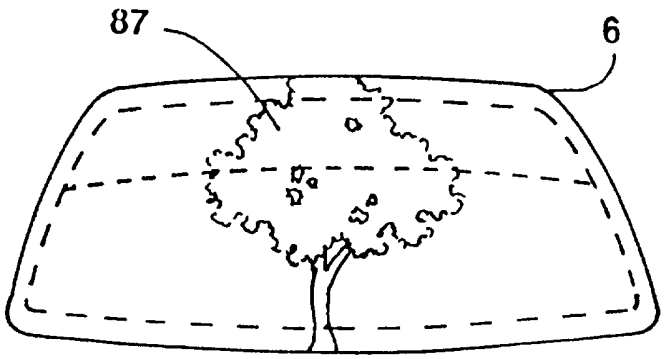

FIG.5D

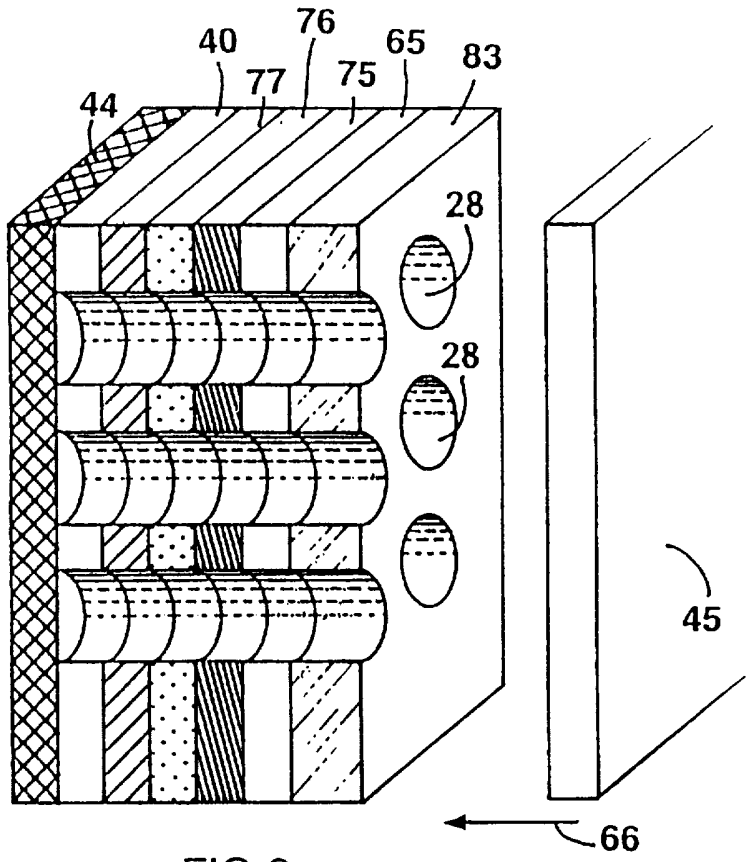

FIG.6

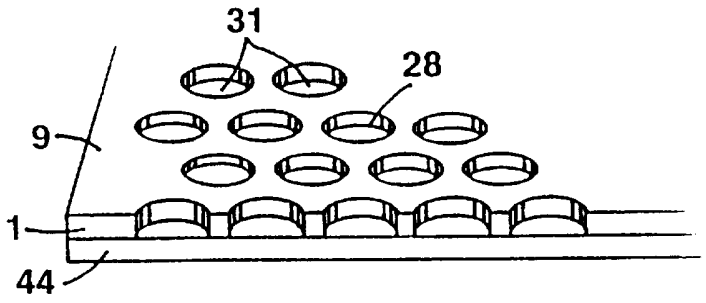

FIG.7A

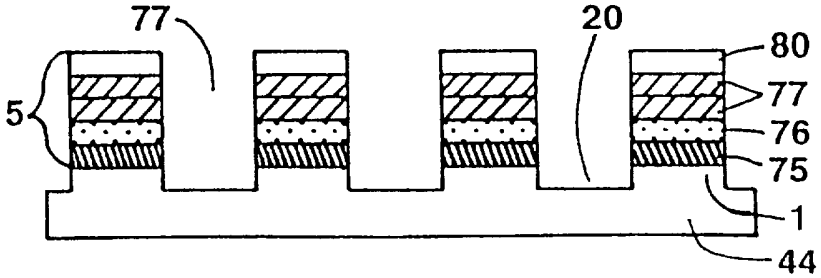

FIG.7B

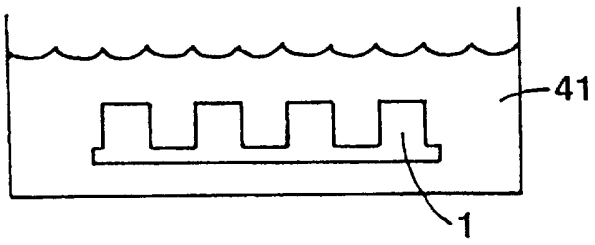

FIG.7C

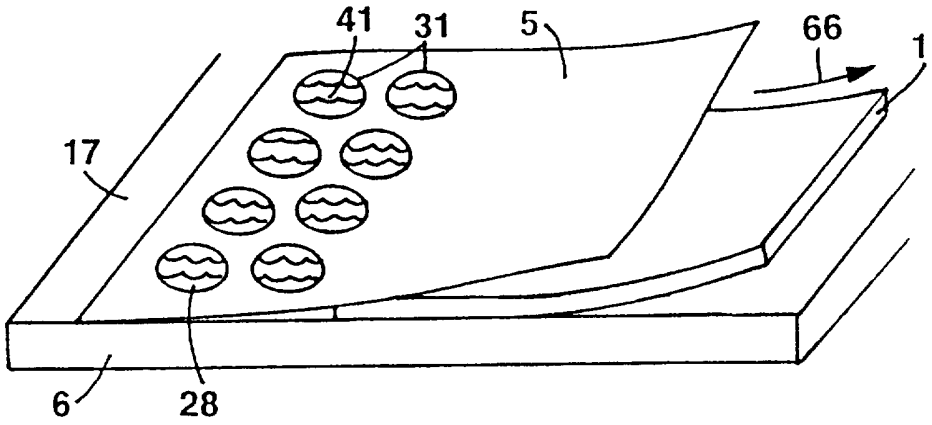

FIG.7D

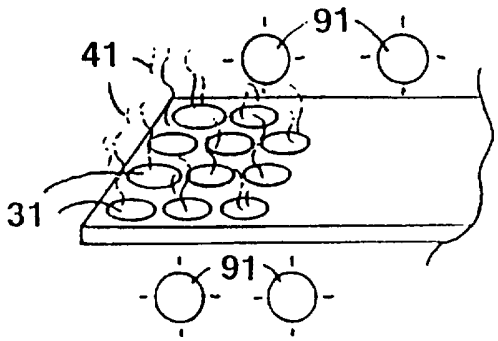

FIG.7E

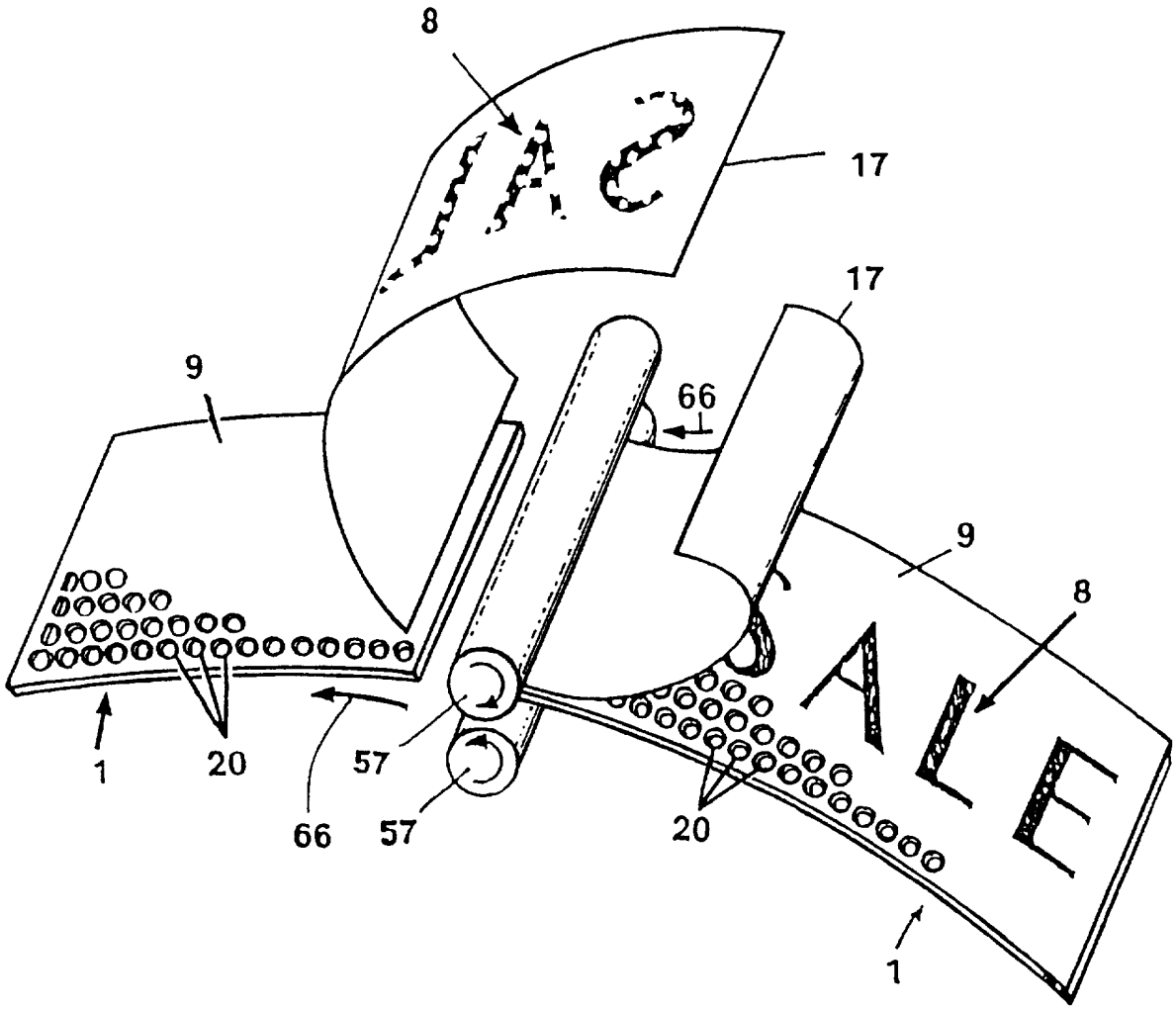

FIG.7F

SHEET 8/12

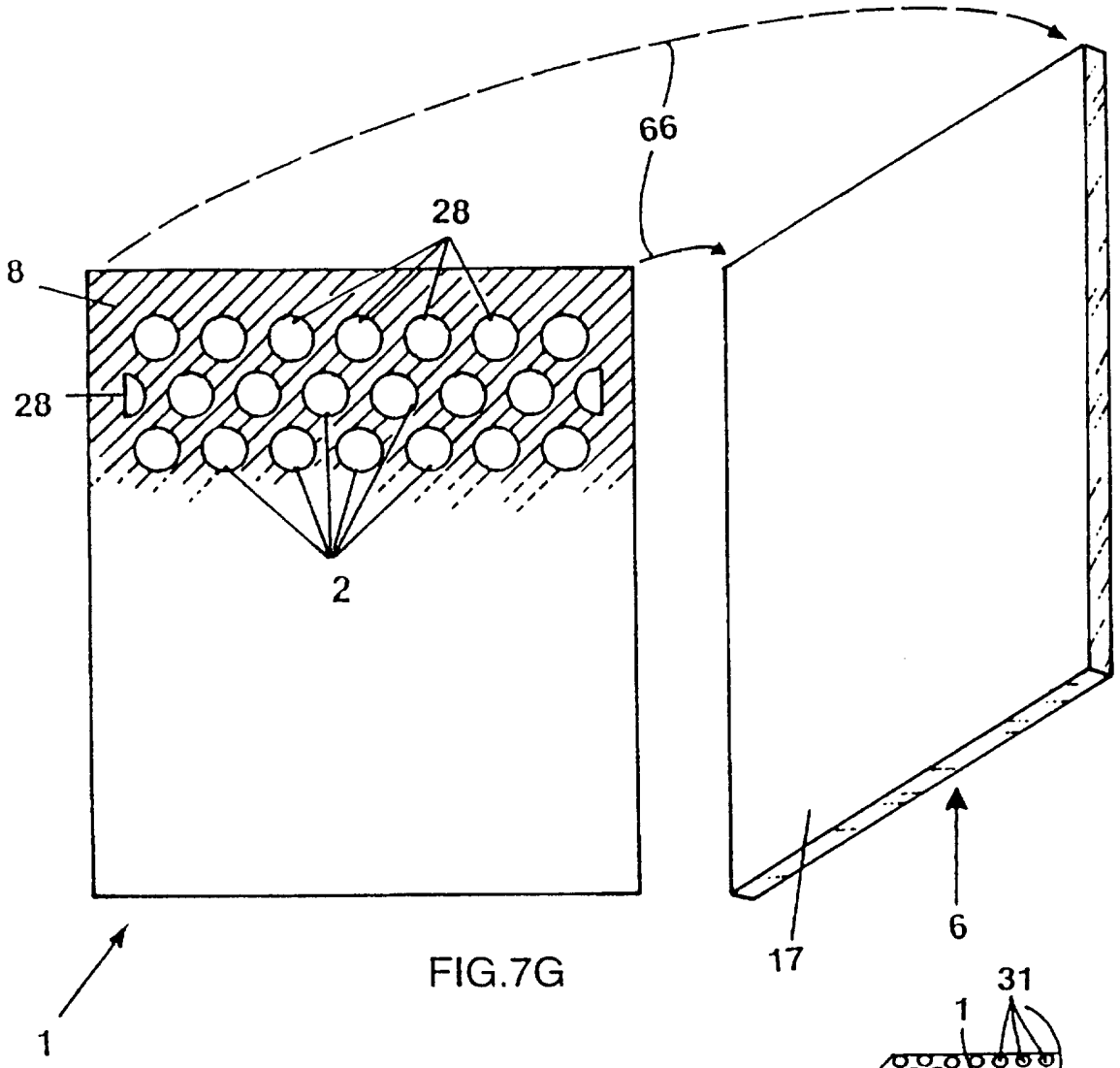

FIG.7G

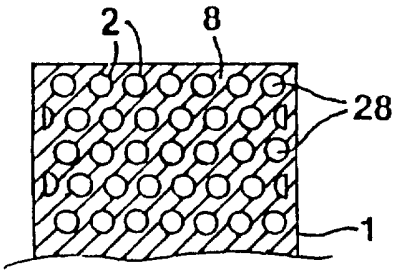

FIG.7H

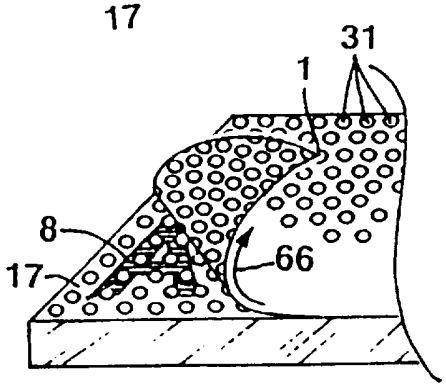

FIG.8A

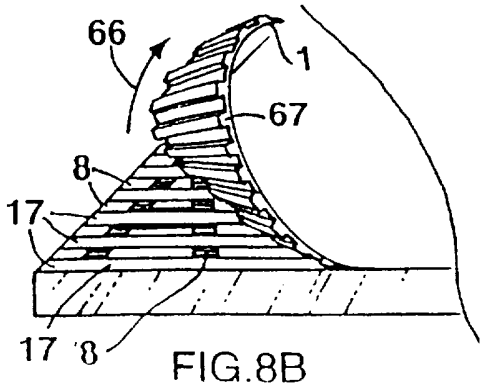

FIG.8B

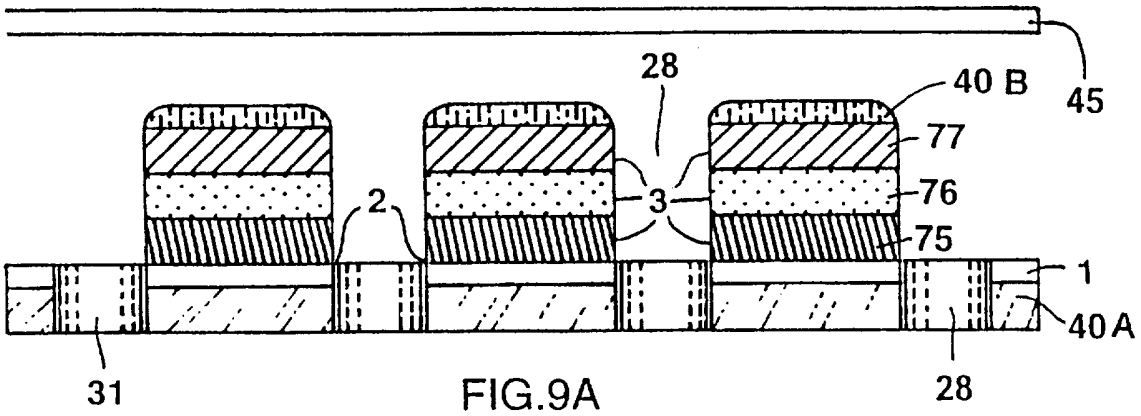

FIG.9A

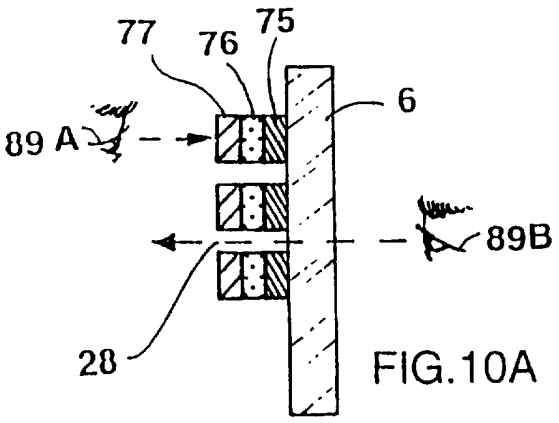

FIG.10A

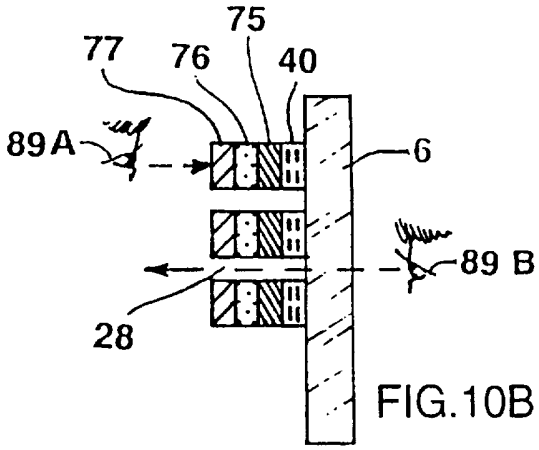

FIG.10B

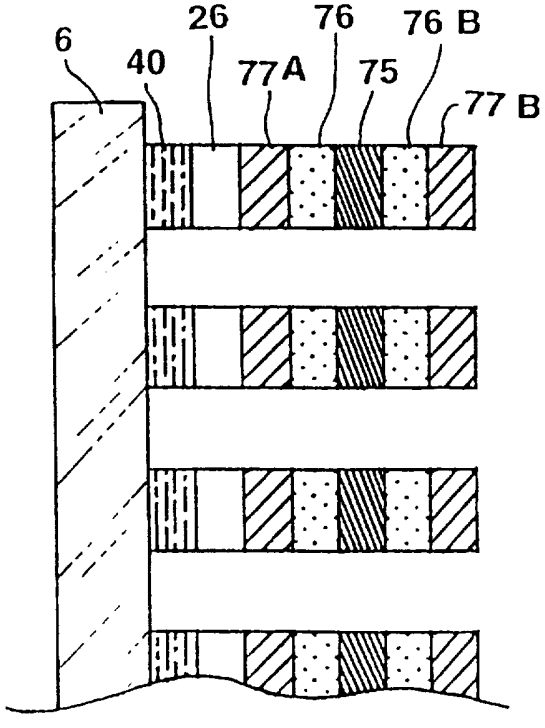

FIG.10C

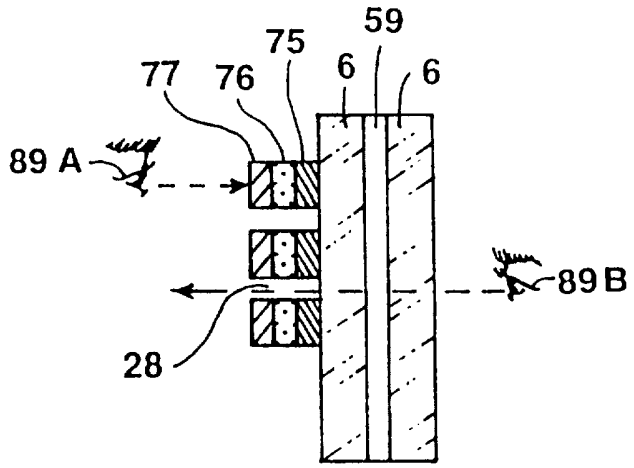

FIG.10D

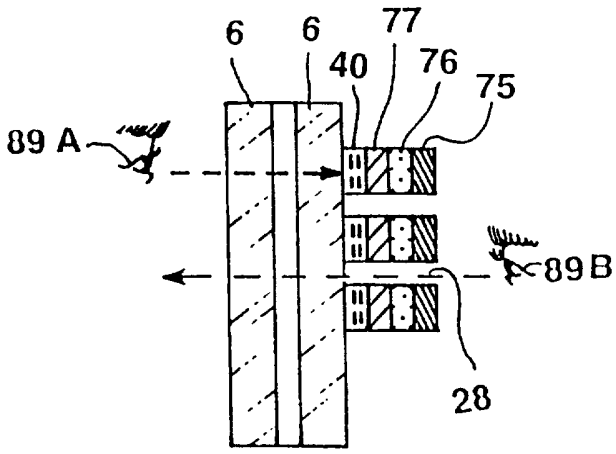

FIG.10E

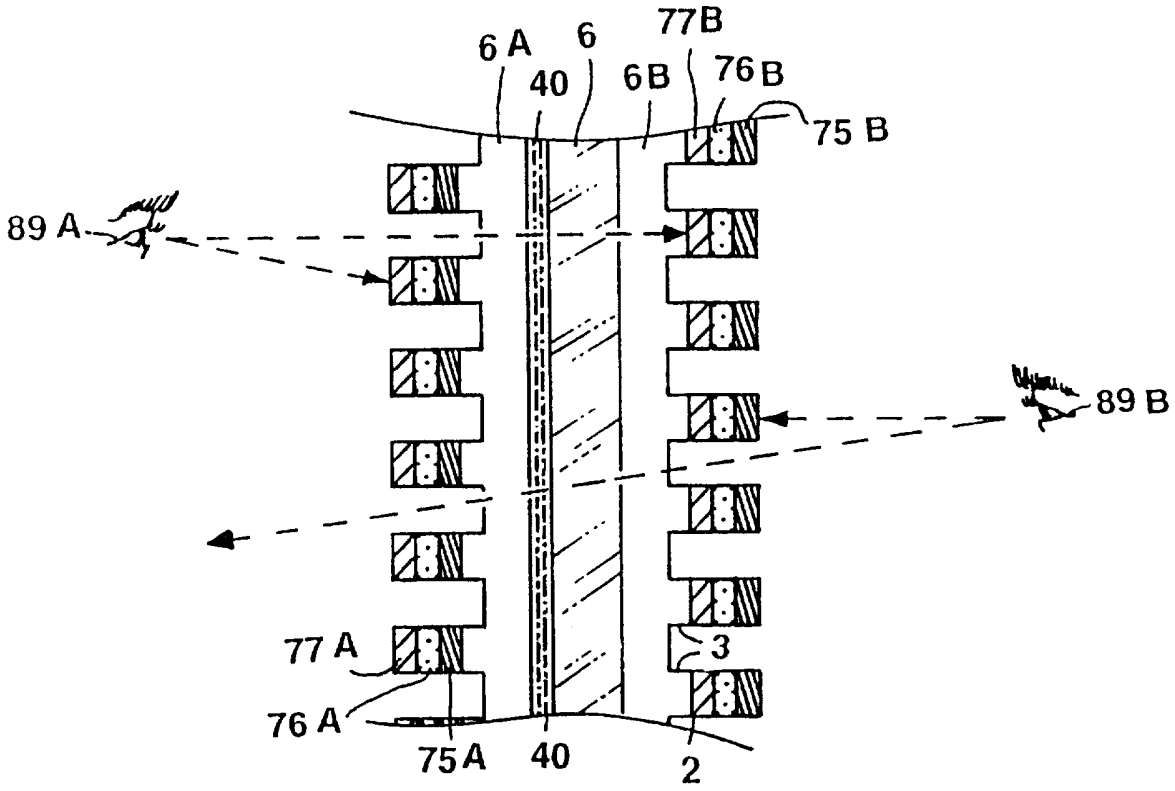

FIG.11A

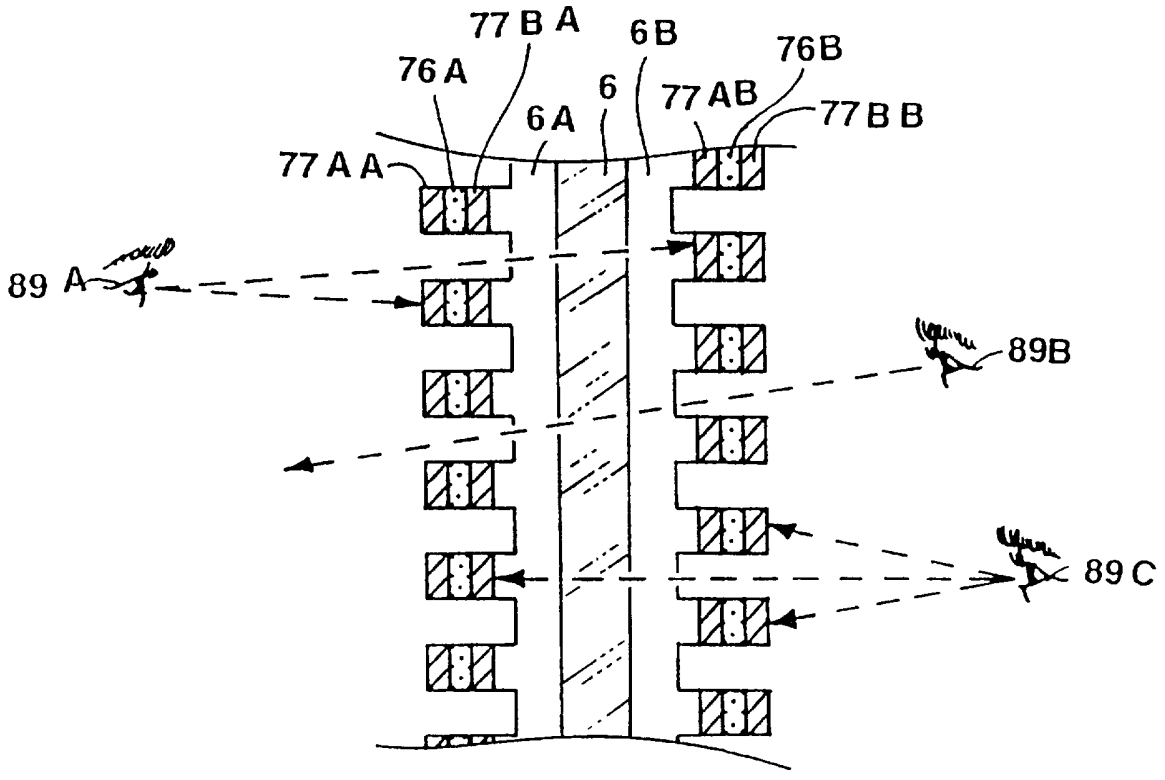

FIG 11 B

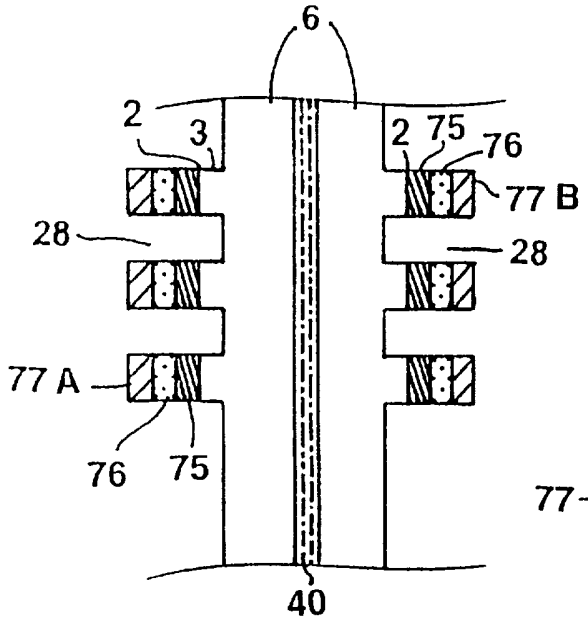

FIG.11C

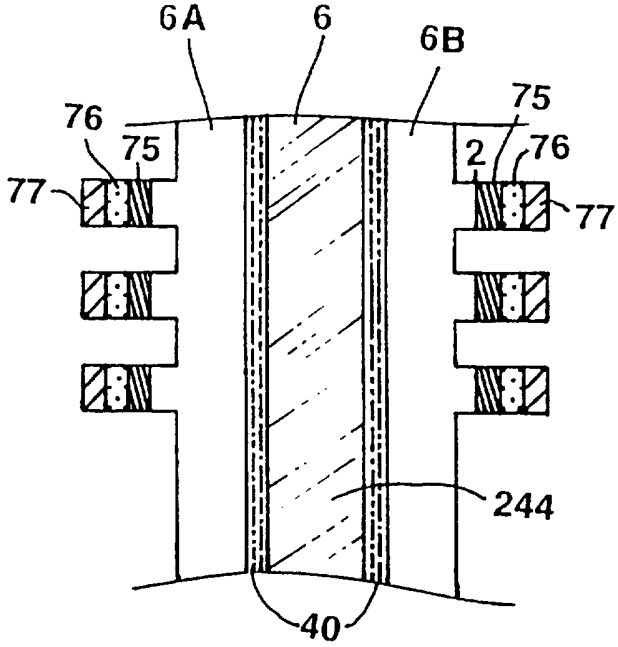

FIG.11D

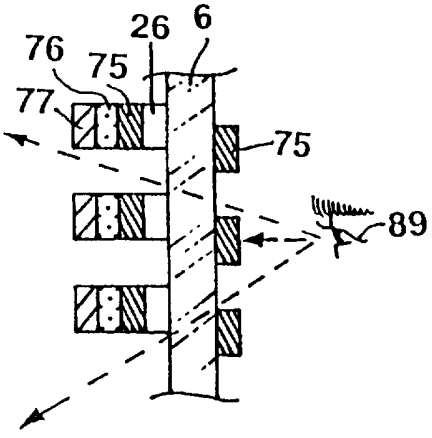

FIG.11E

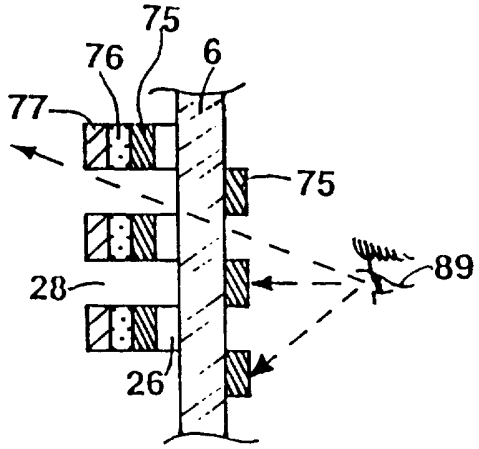

FIG.11F

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/00046

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B05D 3/12, 5/06; B32B 3/18; B41M 3/12; B44C 1/165
US CL : 156/230, 252; 427/152, 163.1, 264
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 156/230, 240, 252; 427/149, 152, 163.1, 165, 264, 270, 276, 289; 101/32, 492

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS
search terms: release coat####, transfer####, perforat###, punch##, hole#, registration, transparent, water slide

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,432,258 A (YOSHIMURA) 11 July 1995, col. 1, lines 14-31 and col. 6, lines 1-45.	1-10
Y	US 5,449,426 A (LIN) 12 September 1995, col. 3, line 43 to col. 4, line 61.	1,2,5-10
Y	US 3,990,784 (GELBER) 09 November 1976, col. 10, lines 7-65.	6,7,9,10
Y	US 4,545,838 A (MINKUS ET AL) 08 October 1985, col. 5, lines 1-18.	4
Y	US 4,300,934 A (DETORRE) 17 November 1981, col. 3, lines 8-25.	8
A,P	US 5,525,177 A (ROSS) 11 June 1996.	1-10

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search
06 MARCH 1997

Date of mailing of the international search report
08 MAY 1997

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231
Facsimile No. (703) 305-3230

Authorized officer
FRED J. PARKER
Telephone No. (703) 308-2333

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