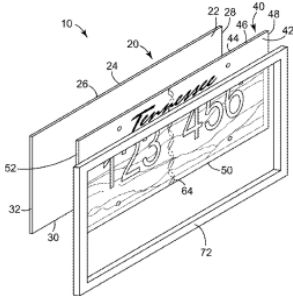


## PATENTS

The following is a synopsis of all patents held by Rolf Biernath, PhD.

### Optically active materials and articles and systems in which they may be used

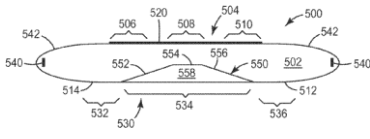
Patent date Issued Feb 28, 2017 Patent issuer and number us 9,581,740



The inventors of the present application developed novel optically active materials, methods, and articles. One embodiment of the present application is an optically active article, comprising: an infrared-reflecting material positioned adjacent to an optically active substrate such that the infrared-reflecting material forms a pattern that can be read by an infrared sensor when the optically active substrate is illuminated by an infrared light source. Another embodiment of the present application relates to a method of manufacturing an optically active article, comprising: obtaining an optically active sheeting; and positioning an infrared-reflecting material on the optically active sheeting to form a pattern. The optically active article may be, for example, a license plate.

### Backlights having selected output light flux distributions and display systems using same

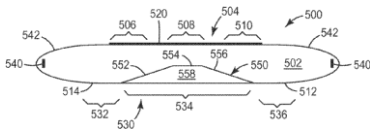
Patent date Issued Jan 10, 2017 Patent issuer and number us 9,541,698



A backlight that includes a front reflector (120) and a back reflector (130) that form a hollow light recycling cavity including an output surface (104) is disclosed. At least a portion of the back reflector is non-parallel to the front reflector. The backlight also includes at least one semi-specular element disposed within the hollow light recycling cavity, and one or more light sources (140) disposed to emit light into the hollow light recycling cavity, where the one or more light sources are configured to emit light into the hollow light recycling cavity over a limited angular range.

### Backlights having selected output light flux distributions and display systems using same

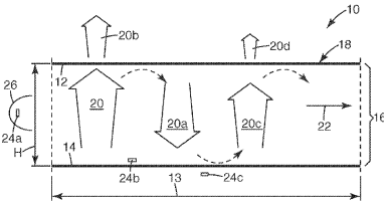
Patent date Issued Dec 29, 2015 Patent issuer and number us 9,222,650



The disclosure generally relates to switchable light extractors and in particular to switchable light extractors useful for extracting light from light ducts used for interior lighting of a building. The disclosure also relates to lighting systems that include the light extractors, and methods of extracting light from a lighting system. The switchable light extractors generally include a first and a second reflective film, each having a plurality of voids that can be aligned to extract light from a light duct.

## Switchable light-duct extraction

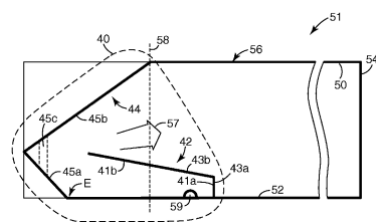
Patent date Issued Jul 28, 2015 Patent issuer and number us 9,091,408



A recycling cavity such as used in a backlight or similar extended area source includes a front and back reflector, the front reflector being partially transmissive to provide an output illumination area. The recycling cavity also includes a component that provides the cavity with a balance of specular and diffuse characteristics so as to balance cavity efficiency and brightness uniformity over the output area. The component can be characterized by a transport ratio of greater than 15% for a 15 degree incidence angle, and less than 95% for a 45 degree incidence angle.

## Collimating light injectors for edge-lit backlights

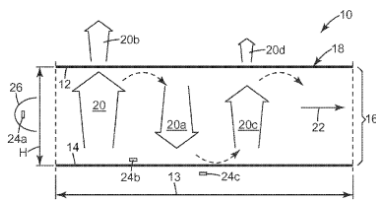
Patent date Issued May 12, 2015 Patent issuer and number us 9,028,108



Illumination devices whose function are to inject light into backlights, particularly into backlights that incorporate a recycling cavity formed by a front (50) and back (52) reflector, are described. In some embodiments, the device includes a light source (59) disposed proximate the back reflector, and first (42) and second (44) reflecting structures. The first reflecting structure includes an inner reflective surface (41b) at least a portion of which is inclined to form a wedge with the back reflector. The wedge partially collimates and directs light from the light source generally away from the recycling cavity. The second reflecting structure receives light exiting the wedge and redirects such light into an injection beam directed into the recycling cavity.

## Thin hollow backlights with beneficial design characteristics

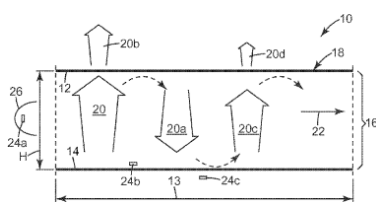
Patent date Issued Jan 6, 2015 Patent issuer and number us 8,926,159



A front and back reflector are arranged to form a hollow light recycling cavity having an output region, and one or more light sources (e.g. LEDs) are disposed to emit light into the cavity. In one aspect, the back reflector has a design characterized by a first and second parameter. The first design parameter is a ratio of the collective emitting area of the light sources  $A_{emit}$  to the area of the output region  $A_{out}$ , and  $A_{emit}/A_{out}$  is preferably from 0.0001 to 0.1. The second design parameter is  $SEP/H$ , where  $H$  is the depth of the recycling cavity, and  $SEP$  is an average plan view source separation associated with the light sources. Other aspects of the disclosed extended area light sources are also described.

## On-product projection for digital merchandizing

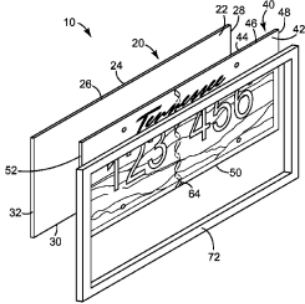
Patent date Issued Dec 30, 2014 Patent issuer and number us 8,919,969



A system for on-product projection and display of electronic content. The system includes a projector for projecting electronic content, a mirror film stack having a reflective surface facing the projector, and a product having an exterior surface facing the reflective surface of the mirror film stack. A graphic is located on a surface of the mirror film stack opposite the reflective surface. The electronic content from the projector is projected onto the exterior surface of the product via the reflective surface of the mirror film stack. The graphic can be located on a display window and hide the mirror from a viewer without completely blocking a view of the projected electronic content. The product can include a removable projection screen for displaying the electronic content, and the projection screen can include a removable label on its non-viewer side to advertise or promote the product.

## Optically active materials and articles and systems in which they may be used

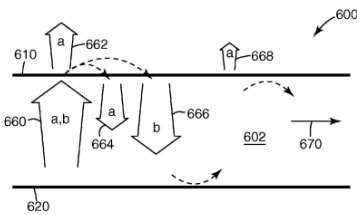
Patent date Issued Oct 21, 2014 Patent issuer and number us 8,865,293



The inventors of the present application developed novel optically active materials, methods, and articles. One embodiment of the present application is an optically active article, comprising: an infrared-reflecting material positioned adjacent to an optically active substrate such that the infrared-reflecting material forms a pattern that can be read by an infrared sensor when the optically active substrate is illuminated by an infrared light source. Another embodiment of the present application relates to a method of manufacturing an optically active article, comprising: obtaining an optically active sheeting; and positioning an infrared-reflecting material on the optically active sheeting to form a pattern. The optically active article may be, for example, a license plate.

## Backlight and display system using same

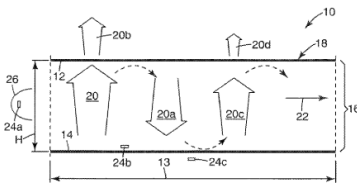
Patent date Issued Jun 3, 2014 Patent issuer and number us 8,740,442



A backlight that includes a front reflector and a back reflector that form a hollow light recycling cavity including an output surface is disclosed. The backlight further includes one or more light sources disposed to emit light into the light recycling cavity. The front reflector includes an on-axis average reflectivity of at least 90% for visible light polarized in a first plane, and an on-axis average reflectivity of at least 25% but less than 90% for visible light polarized in a second plane perpendicular to the first plane.

## Recycling backlights with semi-specular components

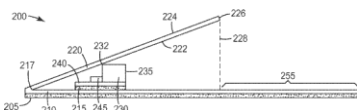
Patent date Issued Dec 17, 2013 Patent issuer and number us 8,608,363



A hollow light-recycling backlight has a “semi-specular” component providing a balance of specularly and diffusely reflected light improving the uniformity of the light output. The component may be arranged on the reflectors (1021), (1014) or inside the cavity (1016). This balance is achieved by designing the component’s “transport ratio” defined by  $(F-B)/(F+B)$ , (F and B are the amounts of incident light scattered forwards and backwards respectively by the component in the plane of the cavity) to lie in a certain range. Furthermore, the product of the front and back reflector “hemispherical” reflectivities should also lie in a given range. Alternatively, the “cavity transport value”, a measure of how well the cavity can spread injected light from the injection point to distant points in the cavity should lie in a further range and the “hemispherical” reflectivity of the back reflector should be  $>0.7$ .

## Collimating light engine

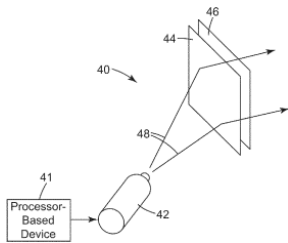
Patent date Issued Dec 17, 2013 Patent issuer and number us 8,608,362



Collimating light engines, methods of making collimating light engines, and articles incorporating collimating light engines are disclosed. In one aspect, a light source and circuitry can be disposed between a reflector and a reflective baffle to form a collimating light engine. The light source is at least partially obscured from view by the reflective baffle. Light emitted from the light source is partially collimated upon leaving the light engine. Light uniformity of the output surface of a backlight can be proved by disposing an array of the collimating light engines in the backlight.

## High angle rear projection system

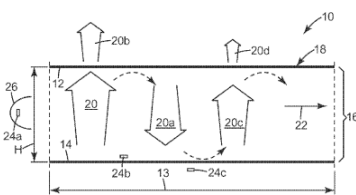
Patent date Issued Dec 3, 2013 Patent issuer and number us 8,599,483



A system for projecting content at an angle to a rear projection screen. The system includes a projector configured for projecting changeable electronic content and a rear projection screen for receiving the projected content at an angle and displaying the projected content. The rear projection screen includes a turning film having prisms facing toward or away from the projector. For prisms facing toward the projector, a protective film covers the turning film. When the projected content is displayed on the rear projection screen, the content has a substantially uniform appearance.

## Thin hollow backlights with beneficial design characteristics

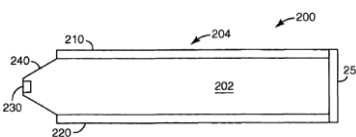
Patent date Issued Sep 3, 2013 Patent issuer and number us 8,523,419



An edge-lit backlight comprises a front and back reflector forming a hollow light recycling cavity having a cavity depth  $H$  and an output region of area  $A_{out}$ , and one or more light sources disposed proximate a periphery of the backlight to emit light into the light recycling cavity. The light sources have an average plan view source separation of  $SEP$  collectively having an active emitting area  $A_{emit}$ , wherein a first parameter equals  $A_{emit}/A_{out}$  and a second parameter equals  $SEP/H$ . The first parameter is in a range from 0.0001 to 0.1, and by the second parameter is in a range from 3 to 10. The front reflector has a hemispherical reflectivity for unpolarized visible light of  $R_{sup.f.sub.hemi}$ , and the back reflector has a hemispherical reflectivity for unpolarized visible light of  $R_{sup.b.sub.hemi}$ , and  $R_{sup.f.sub.hemi} * R_{sup.b.sub.hemi}$  is at least 0.70.

## Backlight and display system using same

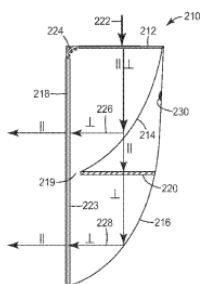
Patent date Issued Jun 25, 2013 Patent issuer and number us 8,469,575



A backlight that includes a front reflector and a back reflector that form a hollow light recycling cavity including an output surface is disclosed. The backlight further includes one or more light sources disposed to emit light into the light recycling cavity. The front reflector includes an on-axis average reflectivity of at least 90% for visible light polarized in a first plane, and an on-axis average reflectivity of at least 25% but less than 90% for visible light polarized in a second plane perpendicular to the first plane.

## Hybrid daylight-coupled backlights for sunlight viewable displays

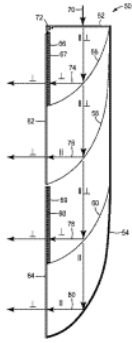
Patent date Issued Feb 26, 2013 Patent issuer and number us 8,384,852



A daylight-coupled display includes a plurality of passive backlights cascaded in a stack for backlighting of LCD panels or static display panels. The display includes a diffuser to transmit light to multiple cascaded curved reflectors, each of which reflects light for backlighting of the display. A polarization rotator is located within the backlight such that the reflectors provide the correct polarization of light to the LCD panel for backlighting of it. One daylight-coupled display can include an active light source to provide light to the reflectors. A secondary light source can provide light to at least one of the reflectors to provide backlighting of the display in low lighting conditions.

## Passive and hybrid daylight-coupled N-stack and collapsible backlights for sunlight viewable displays

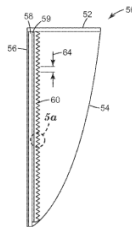
Patent date Issued Dec 25, 2012 Patent issuer and number us 8,339,542



A passive daylight-coupled display having an LCD panel, a diffuser, and a curved reflector behind the LCD panel. For passive backlighting, the diffuser transmits daylight to the reflector, which reflects the daylight to the LCD panel and provides for substantially uniform distribution of the daylight on the LCD panel for backlighting it. An N-stack daylight-coupled display includes a plurality of passive backlights cascaded in a stack for backlighting of LCD panels or static display panels. One N-stack display can include an active light source to provide light to the reflectors, and a secondary light source to provide light to at least one of the reflectors to provide backlighting of the display in low lighting conditions. A collapsible daylight-coupled display includes a daylight-coupled backlight that is collapsible when not in use for hand-held or portable display devices.

## Passive daylight-coupled backlight with turning film having prisms with chaos for sunlight viewable displays

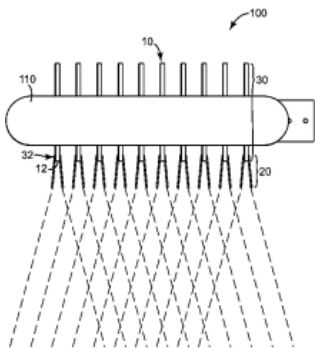
Patent date Issued Jul 24, 2012 Patent issuer and number us 8,228,463



A passive daylight-coupled display having an LCD panel, a diffuser, a turning film behind the LCD panel, and a curved reflector behind the turning film. For passive backlighting, the diffuser transmits daylight to the reflector, which reflects the daylight to the LCD panel through the turning film and provides for substantially uniform distribution of the daylight on the LCD panel for backlighting it. The turning film has prisms with chaos for an improved viewer experience.

## Lighting assemblies and systems

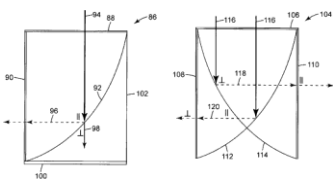
Patent date Issued Jun 5, 2012 Patent issuer and number us 8,192,048



The present disclosure relates to illumination or lighting assemblies and systems that provide illumination using LEDs. In one aspect, the present disclosure provides a lighting assembly, comprising: multiple light emitting diodes that emit light; an optical system that directs the light emitted by the light emitting diodes, the optical system positioned adjacent to light emitting diodes; and a cooling fin including a two-phase cooling system, the cooling fin positioned adjacent to the light emitting diodes such that the two-phase cooling system removes heat from the light emitting diodes. In another aspect, the present disclosure provides a lighting system including multiple lighting assemblies. The lighting assemblies and systems of the present disclosure can be used in, for example, a street light, a backlight (including, for example, a sun-coupled backlight), a wall wash light, a billboard light, a parking ramp light, a high bay light, a parking lot light, a signage lit sign (also referred to as an electric sign), static signage (including, for example, sun-coupled static signage), illuminated signage, and other lighting applications.

## Passive and hybrid daylight-coupled backlights for sunlight viewable displays

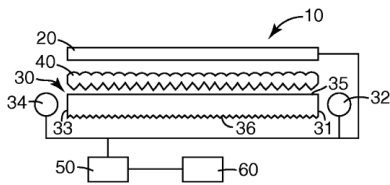
Patent date Issued Apr 3, 2012 Patent issuer and number us 8,149,351



A passive daylight-coupled display having an LCD panel, a diffuser, and a curved reflector behind the LCD panel. For passive backlighting, the diffuser transmits daylight to the reflector, which reflects the daylight to the LCD panel and provides for substantially uniform distribution of the daylight on the LCD panel for backlighting it. A hybrid display includes both a passive backlight and an active backlight for providing backlighting from an active light source.

## Stereoscopic 3D liquid crystal display apparatus having a double sided prism film comprising cylindrical lenses and non-contiguous prisms

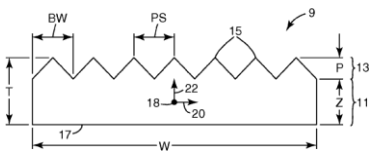
Patent date Issued Nov 29, 2011 Patent issuer and number us 8,068,187



A stereoscopic 3D liquid crystal display module includes a liquid crystal display panel and a directional backlight positioned to provide light to the liquid crystal display panel. A double sided prism film is disposed between the liquid crystal display panel and the directional backlight. The prism film includes a first surface having a series of cylindrical lenses adjacent the liquid crystal display panel and a second surface, opposite the first surface, having a series of non-contiguous prisms adjacent the directional backlight. Each of the non-contiguous prisms is separated from adjacent prisms by a transmissive flat portion or an opaque portion.

## Birefringent structured film for LED color mixing in a backlight

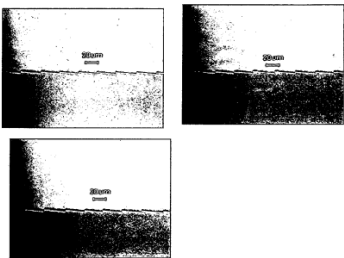
Patent date Issued Nov 30, 2010 Patent issuer and number us 7,843,637



An article for use in light spreading includes a body having first and second surfaces, and first and second in-plane axes that are orthogonal with respect to each other and a third axis that is mutually orthogonal to the first and second in-plane axes in a thickness direction of the body. A portion of the first surface is a birefringent structured surface. The portion is structured such that, when the article receives a light signal within a particular range of wavelengths, the structured surface causes splitting the light signal into a plurality of divergent light signals. The article can be used for color mixing such as in a cavity providing a backlight for LCD devices or other display devices requiring a backlight.

## Article having a birefringent surface and microstructured features having a variable pitch or angles for use as a blur filter

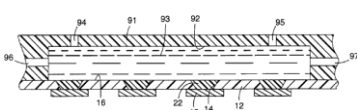
Patent date Issued Aug 26, 2008 Patent issuer and number us 7,418,202



An article for use in light spreading includes a body having first and second surfaces, and first and second in-plane axes that are orthogonal with respect to each other and a third axis that is mutually orthogonal to the first and second in-plane axes in a thickness direction of the body. A portion of the first surface is a birefringent structured surface. The portion is structured such that, when the article receives a light signal within a particular range of wavelengths, the structured surface causes splitting the light signal into a plurality of divergent light signals. The article can be used for color mixing such as in a cavity providing a backlight for LCD devices or other display devices requiring a backlight.

## Film based addressable programmable electronic matrix articles and methods of manufacturing and using the same

Patent date Issued May 22, 2007 Patent issuer and number us 7,220,344

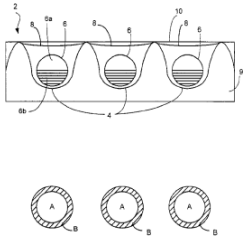


An electronic device adapted for performing molecular biological processes. The device includes a flexible polymeric substrate having a first surface and a second surface. A plurality of microlocations interrupt the first surface, and each of said microlocations include an electrode disposed on the second surface of the flexible substrate. A hydrophilic matrix is positioned on the first surface of the flexible substrate and is capable of electrical contact with the electrode.



## Microstructures with assisting optical lenses

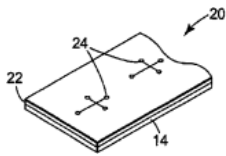
Patent date Issued Jun 6, 2006 Patent issuer and number us 7,057,599



A microstructure to interact with electromagnetic waves by changing optical aspect in selected areas in response to an external signal, the microstructure comprising: a plurality of responsive elements, each responsive element capable of presenting at least two different optical aspects and changing between the optical aspects based on an applied external signal; a support substrate containing the responsive elements; and a plurality of assisting optical lenses each optically enlarging an image from the responsive elements associated with the assisting optical lens.

## Microfluidic articles

Patent date Issued Jul 13, 2004 Patent issuer and number us 6,761,962



The present invention provides various microfluid processing architecture-bearing, polymeric articles. The articles may include microelectronic, microoptical or microchemical elements. The article also may include inorganic thin film coatings.

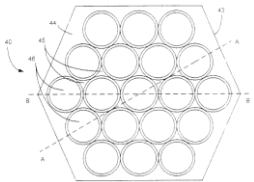
## Encapsulant compositions with thermal shock resistance

Patent date Issued Dec 16, 2003 Patent issuer and number us 6,664,318

A thermomechanical-shock-resistant cured composition for solventless, hydrophobic resin encapsulation of electronic components having a glass transition temperature below 0.degree. C. and containing a non-silicone oligomer including a flexible hydrocarbon backbone with reactive functionality, up to about 40% by weight of an adhesion promoter, and a optional viscosity-modifying component.

## Post and pocket microstructures containing moveable particles having optical effects

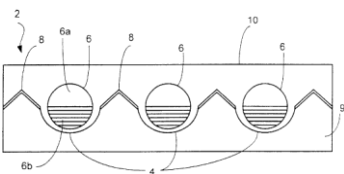
Patent date Issued Jun 10, 2003 Patent issuer and number us 6,577,432



A microfabricated structure to interact with electromagnetic waves, such as a visual display apparatus for positioning movable particles, the structure comprising a substrate containing a plurality of pockets and/or a plurality of posts, and a plurality of optically anisotropic particles placed in the substrate. Pockets are sealable in relation to other pockets and to air, and each pocket being capable of positioning at least one particle.

## Microstructures with assisting optical elements to enhance an optical effect

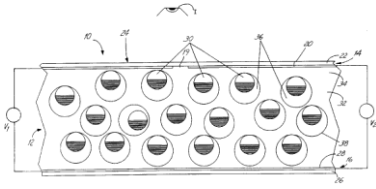
Patent date Issued May 27, 2003 Patent issuer and number us 6,570,700



A microstructure to interact with electromagnetic waves by changing optical aspect in selected areas in response to an external signal, the microstructure comprising: a plurality of responsive elements, each responsive element capable of presenting at least two different optical aspects and changing between the optical aspects based on an applied external signal; and a support substrate containing the responsive elements, wherein at least a part of the support substrate defines an optical structure containing a plurality of assisting optical elements each optically enlarging an image from the responsive elements associated with the assisting optical element.

### Method of improving the responsibility of moveable structures in a display

Patent date Issued Nov 12, 2002 Patent issuer and number us 6,480,322



A method improves the responsibility of moveable structures in a display medium, such as a gyricon display. The inventive method includes heating the display and exercising the rotatable structures within the display by an application of an electrical field. Applying heat to the display enlarges the cavity surrounding each particle due to thermal expansion of the cavity and the bead rotation cycling jostles the particles loose. The inventive method enables a larger percentage of the particles to rotate to a greater degree thereby improving resolution of an image. Alternatively, heating and exercising can be accomplished by application of ultrasonics. In addition, degassing the fluid contained in the display enhances switching with heat and improves the rotatability of the structures.

### Electromagnetically responsive particle assembly and methods and articles for manufacture and use

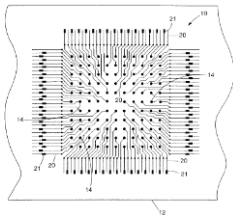
Patent date Issued Oct 8, 2002 Patent issuer and number us 6,462,859



Assemblies containing a substrate with pockets for electromagnetically responsive particles can be made for a variety of uses, including, for example, display media, lenses, and color-changing fabric. The arrangement of these pockets can be selected to provide higher particle density than previously realized. The assembly includes an assembly substrate, particles, and a top coat layer.

### Film based addressable programmable electronic matrix articles and methods of manufacturing and using the same

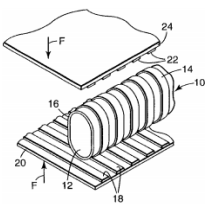
Patent date Issued Sep 17, 2002 Patent issuer and number us 6,451,191



An electronic device adapted for performing molecular biological processes. The device includes a flexible polymeric substrate having a first surface and a second surface. A plurality of microlocations interrupt the first surface, and each of said microlocations include an electrode disposed on the second surface of the flexible substrate. A hydrophilic matrix is positioned on the first surface of the flexible substrate and is capable of electrical contact with the electrode.

### Electronic assemblies with elastomeric members made from cured, room temperature curable silicone compositions having improved stress relaxation resistance

Patent date Issued Jun 11, 2002 Patent issuer and number us 6,403,226

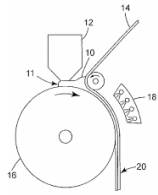


The present invention relates to electronic assemblies which include an elastomeric member made of a cured, room-temperature curable polysiloxane composition. When the assemblies are used to electrically interconnect a first contacting site on a first electronic device to a second contacting site on a second electronic device, the stress-relaxation resistant properties of the elastomer enhance local contact force to maintain a reliable connection.



### Methods of manufacturing microfluidic articles

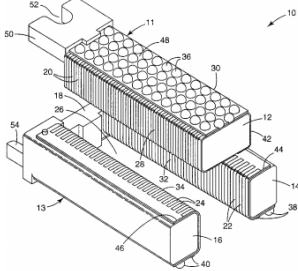
Patent date Issued Apr 23, 2002 Patent issuer and number us 6,375,871



A process for preparing a molded article that includes: (a) bringing a moldable material and an open molding tool comprising a molding surface into line contact with each other to imprint a microfluid processing architecture pattern onto the moldable material and thereby form a molded article; and (b) separating the molded article from said molding surface. The invention also features various microfluid processing architecture-bearing, polymeric articles.

### Separable electrical connector assembly having a planar array of conductive protrusions

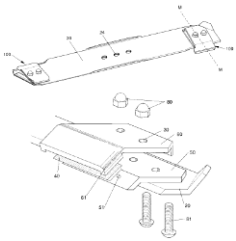
Patent date Issued Mar 2, 1999 Patent issuer and number us 5,876,215



A separable electrical connector assembly includes at least one connector body having a planar array of conductive protrusions. The conductive protrusions can be metallurgically bonded or pressure engaged with conductive contact pads on a surface of a printed circuit substrate, such as a printed circuit board or a flex circuit. In addition, a variety of decoupling means can be incorporated to substantially decouple the metallurgical bonds or pressure engagements from stresses produced by use of the separable electrical connector assembly and differential thermal expansion between the connector body and the printed circuit substrate.

### Lawnmower blade with replaceable knives

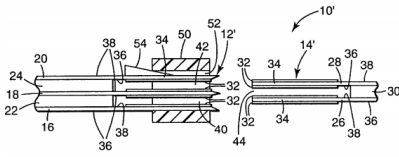
Patent date Issued Nov 24, 1998 Patent issuer and number us 5,839,263



A lawnmower blade with replaceable knife members (40) mounted on the leading edge of a rotating blade body wherein the entire assembly to a rotating shaft of a lawnmower or the like. The knife member (40) is manufactured from carbides, high speed steels, or powder metals, thus producing a cutting edge with high quality and durability. Knife member is attached to a rotating body in either a safety cage assembly (100) or embedded in the body of the blade. The knife member is retained on the blade body and can be rotated to a fresh sharp edge or replaced.

## Electrical connector assembly with interleaved multilayer structure and fabrication method

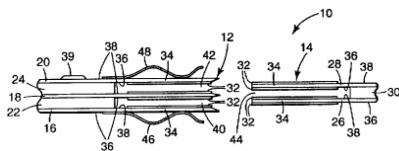
Patent date Issued Oct 27, 1998 Patent issuer and number us 5,827,084



An electrical connector assembly having an interleaved multilayer structure includes a first connector structure having at least a first connector layer, and a second connector structure having at least second and third connector layers. A plurality of conductive contact surfaces are disposed along edge portions of the connector layers. Upon engagement of the first connector structure and the second connector structure, the first connector layer is oriented to engage a gap defined between the second and third connector layers. The interleaved engagement of the connector layers results in an low-profile electrical connector assembly providing a large number of interconnections between respectively aligned contact surfaces with precise alignment and reliable electrical contact. The connector layers may include conductive contact surfaces on one or both sides of each layer to provide higher interconnection densities. The disposition of contact surfaces on both sides of a layer can relax alignment tolerances for a given interconnection density. Nevertheless, precise alignment can be ensured by the use of conventional lithographic techniques to print the contact surfaces. At least some of the connector layers can be made from a material capable of resilient deformation, and can be realized, for example, by flexible printed circuit board layers or flex circuit layers. The resiliently deformable material, when deformed, produces a force that resists deformation. Thus, when interleaved engagement of the connector layers produces deformation, the resisting force serves to bias the connector layers against one another to ensure good electrical contact force.

## Electrical connector assembly with interleaved multilayer structure and fabrication method

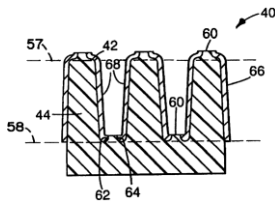
Patent date Issued Apr 21, 1998 Patent issuer and number us 5,741,148



An electrical connector assembly having an interleaved multilayer structure includes a first connector structure having at least a first connector layer, and a second connector structure having at least second and third connector layers. A plurality of conductive contact surfaces are disposed along edge portions of the connector layers. Upon engagement of the first connector structure and the second connector structure, the first connector layer is oriented to engage a gap defined between the second and third connector layers. The interleaved engagement of the connector layers results in an low-profile electrical connector assembly providing a large number of interconnections between respectively aligned contact surfaces with precise alignment and reliable electrical contact. The connector layers may include conductive contact surfaces on one or both sides of each layer to provide higher interconnection densities. The disposition of contact surfaces on both sides of a layer can relax alignment tolerances for a given interconnection density. Nevertheless, precise alignment can be ensured by the use of conventional lithographic techniques to print the contact surfaces. At least some of the connector layers can be made from a material capable of resilient deformation, and can be realized, for example, by flexible printed circuit board layers or flex circuit layers. The resiliently deformable material, when deformed, produces a force that resists deformation. Thus, when interleaved engagement of the connector layers produces deformation, the resisting force serves to bias the connector layers against one another to ensure good electrical contact force.

### Micridge abrasion for selective metalization

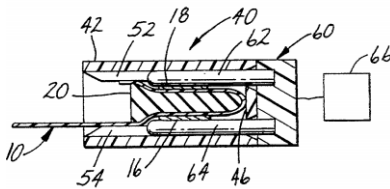
Patent date Issued Apr 7, 1998 Patent issuer and number us 5,736,191



A process for selective metalization for electrically isolating areas of a substrate is disclosed. The process employs placing micridges onto a surface, the micridge protruding from the plane formed by the surface. The surface, including the micridge, is then metalized and a portion of the metalized micridge, beyond the surface plane is removed. This removal process creates electrically isolated areas without affecting the integrity of the substrate.

### Flexible circuit connector

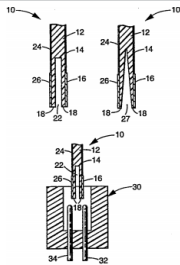
Patent date Issued Jul 18, 1995 Patent issuer and number us 5,433,632



A flexible circuit connector for electrically connecting two electronic devices. The connector includes a flexible circuit sheet having electrically conductive traces which lead from a first electronic device, such as a memory chip, to two arrays of electrically conductive pads. The connector includes a connector housing having two spaced, substantially parallel side walls connected by a front wall having a row of holes adjacent each of the side walls to receive two rows of conductive pins which are connected to a second electronic device, such as a printed circuit board. A unitary, locally deformable, biasing member is positioned within the connector housing and between the two array of conductive pads. The biasing member forces the two arrays of pads into electrical contact with the two rows of pins when the pins are inserted into the holes in the front wall of the connector housing.

### Edge-connecting printed circuit board

Patent date Issued Sep 6, 1994 Patent issuer and number us 5,345,364



A printed circuit board capable of resilient deformation having two major surfaces and a contact edge. Electrically conductive traces are provided on each major surface of the board which lead to electrically conductive contact pads at the contact edge of the board. A gap is provided between the two major surfaces of the board along the contact edge. The gap permits resilient deformation of the board so that a force is created upon deformation which will bias the major surfaces toward their undeformed position. An elastomeric biasing member may be provided in the gap.