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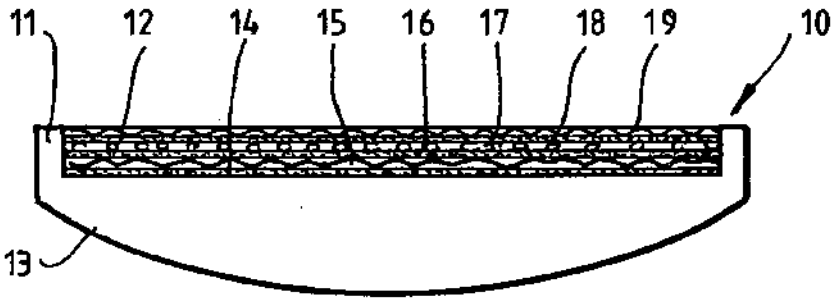
(54) **Title:** SIMULATED OPALS AND DECORATIVE OBJECTS



(57) **Abstract**

A simulated opal or decorative object, including a layer (15) in the form of a distorted film of iridescent material, a layer (17) of a semi-metallised hologram material, and a layer (19) of laser diffraction grating material, all bonded together by layers (16 and 18) of a thermosetting resin, and in turn bonded by a layer (14) of thermosetting resin to a housing (10).

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SIMULATED OPALS AND DECORATIVE OBJECTS

Technical Field

The present invention relates to simulated opals and other decorative objects and methods of making simulated opals and decorative objects suitable for jewellery, souvenirs, clock faces, trophies and buttons etc, but not limited to the foregoing. However for the sake of simplicity of description reference will hereinafter be made to the application of the invention to simulated opals.

Background Art

It has been discovered that the present invention creates a simulant that closely reproduces the true characteristics of genuine opal, especially the white and crystal varieties, and is far superior to existing techniques for creating simulated opals.

The resulting simulated opals display a full face of spectral colours rather than flashes of colour when viewed from specific angles. From a marketing view point the new simulated opals have far more visual impact and look more realistic than any other simulant. The resulting simulated opal appears to be solid and has the characteristics of genuine opal.

The simulated opals may be made in any shape or size or in a variety of qualities to suit different markets and price ranges.

The method of forming the simulated opals also eliminates the necessity for high priced computer equipment and may now, therefore, be assembled by the layman, who is not skilled in the art, by following a set of simple instructions included in an appropriate booklet.

This invention reduces the costs of setting up and gives a better visual effect.

Disclosure of the Invention

The present invention utilises a film of iridescent material and is not a print, photograph transparency hologram or diffraction grating. Such films

or iridescent material are well known, but in the context of the present invention for which they have never previously been used, I have discovered that their properties produce a unique effect. A typical film useful for the purposes of the present invention is manufactured and supplied by Merle Corporation of the U.S.A. The film of iridescent material is semi-transparent and has sections of uniform iridescence, and although semi-transparent the film is also reflective. The reflective nature of the material is intensified when the film is wrinkled, and the more wrinkled the more reflective it becomes. However the main purpose of the film is to create an interference layer between the components of the simulant. The other components of the simulant may be a photographic, photocopy, computer scan print, drawing, etched, embossed or transferred reproduction of the surface of an object, gem stone or opal. Present day holograms and diffraction gratings by themselves when used in such opal simulants do not create an opal effect.

It is important to realise that all opals are different so, from a marketing stand point, it is preferable for the simulated opals to be different.

Each simulated opal has a different sets of steps necessary to create the wide variety of characteristics that simulate the genuine opal.

The use of the film of iridescent material which characterises the present invention is the main discovery which causes the required dispersion of refracted and diffracted light as it passes through the film.

The film makes this effect possible and eliminates the necessity for computer generated images of opal patterns, colours and textures which do not change in colour or reflect spectral colours when the simulated opal is rotated.

In accordance with the present invention there is envisaged a simulated opal or decorative object incorporating at least one layer in the form of a film of

iridescent material in combination with at least one layer of a hologram or diffraction grating material.

The iridescent material in being transparent allows for the spectral colours emanating from the other layers of various holograms or diffraction gratings to be visible on the surface of the housing.

The iridescent material when in its natural form has some effect in creating the required effect, although it has been discovered that when the film material is creased or wrinkled it begins to semi-reflect its base colour at various angles, and the more the creasing or wrinkling the more the reflective nature of the materials at random angles. Unlike hologram or diffraction gratings the colour reflected is the base colour of the material and not spectral colours as is the case with holograms or diffraction gratings.

Therefore, preferably the film of iridescent material is creased or wrinkled.

A further aspect of the use of a film of iridescent material that creates the desired effect is that the film acts as a filter for the reflect spectral colours causing them to change according to the distortion (creasing or wrinkling) of the part of the film from which these colours are eminating.

The resulting finished assembly is the equivalent of the finest high quality opal with a full face of colour changing when viewed from different directions or in different light sources.

Another advantage of this product is that, unlike genuine opal, which often dies in colour when viewed on overcast days or fluorescent light, the simulated opal of the present invention looks good in any light source.

When mounted in a housing the simulated opal of the present invention also eliminates mirroring from the internal surface of the housing.

In order to create the effects of true opal the film of iridescent material may be placed in various

positions relative to other components such as, first, second, third, etc., although the best effect is created when the film is placed in position first with the other components on top.

The invention also envisages a method of forming a simulated opal or decorative object, wherein at least one layer in the form of a film of iridescent material is laminated with at least one layer of a hologram or diffraction grating material.

Preferably the film of iridescent material is screwed up by hand to distort, wrinkle or crease the film.

An alternative is to pre-deform the film by embossing techniques and then laminate the material between two sheets of optically clear material. The result creates a different effect but would fall into a lower quality category at a lower price.

Brief Description of the Drawings

Preferred forms of the invention will be more fully described with reference to the accompanying drawings, in which:

Figure 1 is a view of a housing for one preferred form of a simulated opal;

Figure 2 is a view of a housing ready for assembly of the opal;

Figures 3, 4, 5 and 6 show the assembly of the simulated opal;

Figure 7 is a schematic view of the assembly of another preferred form of simulated opal; and

Figure 8 is a schematic view of the assembly of a still further preferred form of simulated opal.

Best Modes for Carrying Out the Invention

In the first preferred embodiment of the invention as shown in Figures 1 to 6, a housing 10 is provided which may be of any shape or size with a flat undulating, engraved, embossed or domed top surface 13. The bottom of the housing has a peripheral lip or retaining wall 11 defining a recess 12. The top surface of the

housing should be highly polished but the recess 12 provides better adherent qualities if it is matt, although it may also be polished.

The recess 12 may be concave, undulating, embossed, engraved or convex.

Figure 2 shows the housing ready for assembly of the simulated opal.

The assembly steps will now be described with reference to Figures 3 to 6 of the drawings.

1. Resin 14 is firstly applied to the internal recess 12 of the housing as shown in Figure 3.

2. With reference to Figure 4 of the drawings, a layer 15 of preformed (creased or wrinkled) iridescent material in film form is prepared and inserted into the recess 12 of the housing. A smooth rounded instrument F or a finger is then used to spread the resin layer beneath the film to ensure complete adherence of the film to the internal recess and also to eliminate possible air bubbles.

3. Once the film has been correctly adhered in position a second layer 16 of resin is applied, and at this time a decision is made as to what type of opal effect is required. There are several choices of materials to be used depending on the type of simulated opal required.

SEMI-BLACK OPAL

a) A preformed insert in the form of a layer 17 of semi-metallised hologram material is placed in the assembly on top of the layer of resin as shown in Figure 5.

Again the finger or a rounded instrument F is used to push down the layer of hologram and to remove air bubbles from the underlying resin.

b) As an alternative to a) a deformed laser pattern hologram is used in place of the layer of semi-metallised holograph material, and any air bubbles are removed as previously described. It is optional whether a further rigid layer is applied to complete the laminate and dependent upon whether the simulated opal is to be sold in

a setting or loose.

4. After completion of step 3a) it is again optional as to which direction is taken according to the characteristics required.

a) With reference to Figure 6 of the drawings, a further layer of 18 of resin may be applied and a precut deformed or distorted laser diffraction grating 19 then applied and pressed down with the finger or the smooth rounded instrument to remove all air bubbles.

b) An alternative to 4a) is to replace the deformed hologram with a black insert providing a backing for the laminate or with a transparency laminated to a hologram backing.

The present invention is not limited to the number of layers described in the laminate described above, and the positioning of the film of iridescent material may vary throughout the laminate and there may also be more than one layer of such film.

In this respect in one alternative form of laminate to form a simulated opal, the first layer to be positioned after the application of the resin to the recess of the housing may be a preformed piece of semi-metallised hologram material inserted into the housing. Another layer of resin is added and a precut deformed (creased or wrinkled) film of iridescent material is then applied with all air bubbles removed. Further layers in the form of film of iridescent material, hologram or transparency either flat, laminated, embossed or deformed, are added between intervening layers of resin.

The deforming of the film of iridescent material can make it difficult to handle during assembly because of its flexible nature. In order to offset this problem it can be laminated with semi-metallised hologram material and a rigid back inserted to prevent the film from separating due to its flexibility and which separation would allow air to enter between the layers. When assembled, and during

the drying period for the resins, it may be necessary to clamp the assembly to prevent separation of the layers within the assembly.

The combination of the film of iridescent material, semi-metallised hologram or laser diffraction gratings create the effect desired for simulated opals. Furthermore in order to more closely simulate the opal with a genuine opal, an opal like pattern may be embossed in relief into one or all of the layers of film prior to cutting, and such embossing can take the place of distorting of the film.

In the present invention the colours and patterns are created by the materials themselves without the necessity to add colour. The changing effect are a combination of iridescence, and hologram or diffraction grating, colours where, in place of a photographic reproduction of the surface of an opal, the total laminate is responsible for play of colour, depth or colour, and pattern. The resulting simulated object is brighter and looks more realistic.

In another embodiment of this invention the layers of iridescent film, hologram, diffraction grating and rigid backing are laminated together to form an assembly which may be cut to a standard size and a thermosetting resin poured on the cut out to form a meniscus. The assembly may also be placed in a preformed backing member with a peripheral lip and thermosetting resin then poured. In this instance the assembly replaces the simulated opal chips but the resulting simulated opal looks solid. The assembly may also be placed in a housing with the addition of resin, and although such saves time it is not as effective.

In this embodiment of the invention, the hologram layer may be replaced by layers of semi-metallised holograms made to simulate differing opal like patterns followed by a reflective layer.

In lower quality simulated opals, or when

different colour opals are required, coloured film may be interposed between any of the layers to create the required effect.

In all embodiments of the invention the simulated opal is unique in that the patterns, textures and colours obtained are completely random and more opal-like due to the layer of iridescent film.

In a further preferred embodiment of the invention the steps according to the last described embodiment are followed but the precut assembly is placed on a flat, surface and a thermo-setting resin is poured to form a meniscus. In both the last two preferred embodiments the surface of the resin is "flamed" with a gas torch to heat the resin until the bubbles appear on the surface with further flaming then eliminating the bubbles.

In a still further embodiment of the invention the layers of materials are embedded in a resin using a reusable housing. The benefit of this method is that the embodiment maybe made in slabs which may then be sawn, cut, shaped and polished by hand or robotically.

This embodiment of the invention may have appeal to gem cutters and hobbyists who wish to cut and polish the simulated opal to their own specifications. This is an advantage over the other embodiments as the simulated opal may be cut and shaped to fit existing settings.

Any number of combinations of the following components may be used in this embodiment of the invention.

1. Preformed acrylic or like plastic housing.
2. Suitable transparent thermo-setting resin or hot injection plastic.
3. Precut iridescent film to create the interference layer within the simulated opal.
4. Precut semi-metallised hologram or diffraction grating - optional.
5. Precut semi-metallised hologram or diffraction grating.
6. Precut transparent image of the surface of a thin

slice of opal photographed in glycerine or similar refractive fluid on a black background. For convenience the transparency is laminated to a hologram using an optically clear transfer film - optional.

7. Preformed rigid plastic insert -optional.

8. Alternatively a coloured preformed insert may replace 6 above.

9. Backing member with peripheral lip.

10. Reusable housing.

Figure 7 shows schematically another preferred form of simulated opal in accordance with the invention.

In Figure 7, a laminate 20 is formed from a meniscus layer 21 of thermosetting resin, a laminate film 22, a pre-distorted layer of iridescent film 23, a further laminate film 24, optically clear transfer tape 25, a layer of semi-metallised hologram 26, optically clear transfer tape 27, a layer of pre-distorted hologram 28 or other reflective backing, and finally a backing member 29 with a peripheral lip 30.

The layers 22 to 28 are prelaminated in sheet form and cut to the desired shape and size. The resin layer 21 is applied to the surface of the prelaminate and allowed to set.

Another option is to prelaminate layers 22 to 28 and then place the assembly in the backing member 29. The resin is then poured to form a meniscus to the outer edge of the peripheral lip 30 thereby enclosing the precut laminated layers.

With reference to the embodiment of Figure 8 of the drawings layer 31 is a resin layer, layer 32 is a film of distorted iridescent material, layer 33 is a resin, layer 34 is a semi-metallised holographic material, layer 35 is a resin, layer 36 is a predistorted reflective hologram, layer 37 is resin, layer 38 is distorted iridescent material, layer 39 is again resin, layer 40 is a transparent rigid insert and layer 41 is again resin.

In an alternative layers 32 and 38 may be laminated after distortion.

The materials used in layers 32, 36 and 38 should be distorted, crinkled or embossed to create an uneven surface for reflection of light at varying angles to once again create an effect similar to that of genuine opal.

In an alternative of the embodiment of Figure 8 of the drawings, layer 31 is resin, layer 32 is distorted iridescent material, layer 33 is resin, layer 34 is a distorted hologram, layer 35 is resin, layer 36 is distorted iridescent material, layer 37 is resin, layer 38 is a transparent rigid insert and layer 39 is resin.

Layer 39 in this alternative is the last layer.

In a further alternative of the embodiment of Figure 8 of the drawings, layer 31 is resin, layer 32 is distorted iridescent material, layer 33 is resin, layers 34 and 36 are prelaminated with an optical grade transfer tape (layer 35). Layer 34 is an image of an opal pattern on a transparent substrate and layer 36 is a specially designed opal effect hologram. Layer 37 is resin, layer 38 is a black opaque rigid insert and layer 39 is resin.

In a still further alternative which creates a lower quality white base opal effect, layer 31 is resin, layer 32 is distorted iridescent material, layer 33 is resin, layer 34 is a rigid opaque white insert and layer 35 is resin. Alternatively an extra layer of semi-metallised hologram and a further layer of resin may be applied prior to the white backing. Alternatively the rigid white opaque insert may be replaced with a rigid opaque black insert to create a black opal effect.

In other embodiments of the invention the various materials, may be placed in a variety of positions to create a variety of effect to simulate the various qualities of opal that occur naturely.

In all embodiments of the invention the amount of distortion of the various iridescent films and holograms creates a wide variety of effects of the simulated opals to

more closely replicate the characteristics of a wide variety of genuine opals.

The iridescent material is reflective and transparent to translucent when embedded but allows sufficient light to penetrate through to the hologram layers which in turn reflect spectral colours at various angles to their distorted plane. The iridescent layer creates an illusion of depth and also gives a full face of a combination of spectral and iridescent colours.

In a still further embodiment of the invention, in the form of a decorative object, such as a sculpture of simulated opal, a three dimensional model of the sculpture is made and a mould produced from the model. The mould is then used to reproduce copies of the original model of the sculpture and having an opening through which a layer of iridescent material in film form is inserted and placed in position as a lining within the mould, whereafter a double-sided hologram material is placed as a layer on the iridescent material, and both the layers of iridescent material and hologram material are then distorted by creasing or wrinkling, or alternatively by embossing prior to insertion in the mould. A thermosetting resin is then poured or injected into the remainder of the interior of the mould, and allowed to cure. After removal from the mould the reproduction of the original sculpture has the appearance of a sculpture formed from opal. As an alternative to producing the mould from a sculptured model an injection moulded mould may be produced.

In a still further embodiment, a cameo is engraved on a die for the purposes of mass production of clear acrylic housings, with rear peripheral lips, such as in the embodiment of Figures 1 to 6, with reproductions of objects such as animals, structures or sporting identities being formed on the other side of the housing, whereafter the opal effect is produced in accordance with, for example, the method of the embodiment of Figures 2 to 6.

Further objects incorporating the present

invention may be created by laminating, stamping, adhering or embossing a hologram onto the surface of a layer of iridescent material or the object itself, or both.

The object may be formed from paper, cardboard, wood, plastic, metal, ceramic, glass or other suitable materials. The object is thereafter produced with overlying layers of the hologram material and the iridescent material, whereafter the combination is overprinted with an opal pattern using transparent inks so that the spectral colours emanating from the surface of the object give the object the appearance of opal.

The same procedure could be followed to produce a flat sheet with a thin backing material which may be used as wrapping material or coverings for boxes and packages. Other applications could be as stickers, cards, including greeting cards, plastic cards and business cards, as well as bookmarks, stamps and labels. Flat sheet so produced may also be applied to fabrics, such as articles of clothing, as well as applied to pens, pencils and other articles where an opal-like decoration may be desired.

CLAIMS:

1. A simulated opal or decorative object incorporating at least one layer in the form of a film of iridescent material in combination with at least one layer of the hologram or diffraction grating material, and forming a laminate.

2. A simulated opal or decorative object as claimed in Claim 1, wherein the film of iridescent material is distorted by creasing, wrinkling or embossing.

3. A simulated opal or decorative object as claimed in Claim 1 or 2, wherein the film or iridescent material and the layer of hologram or diffraction grating material are bonded together with a thermosetting resin.

4. A simulated opal or decorative object as claimed in any one of the preceding claims, wherein the laminate is bonded to a backing plate or housing.

5. A simulated opal or decorative object as claimed in any one of the preceding claims, further including one or more layers of optically clear adhesive tape.

6. A simulated opal or decorative object as claimed in Claim 1, wherein the laminate is overprinted with an opal pattern.

7. A method of forming a simulated opal or decorative object, wherein at least one layer in the form of a film of iridescent material is laminated with at least one layer of a hologram or diffraction grating material.

8. A method as claimed in Claim 7, wherein the film of iridescent material is distorted by creasing, wrinkling or embossing.

9. A method as claimed in Claim 7 or 8, wherein the layers in the laminate are bonded together by a thermosetting resin.

10. A method as claimed in any one of Claims 7 to 9, wherein the laminate is bonded to a backing plate or housing.

11. Simulated opals or decorative objects, substantially as hereinbefore described, including those described with reference to the accompanying drawings.

12. A method as claimed in Claim 7, wherein the laminate is overprinted with an opal pattern.

13. Methods of forming simulated opals or decorative objects substantially as hereinbefore described.

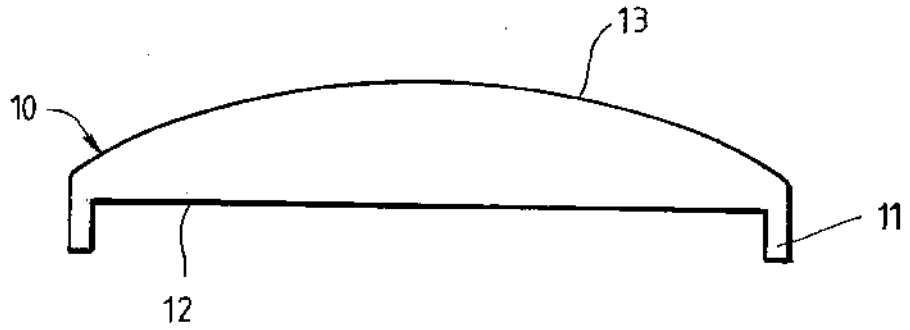

FIG. 1.

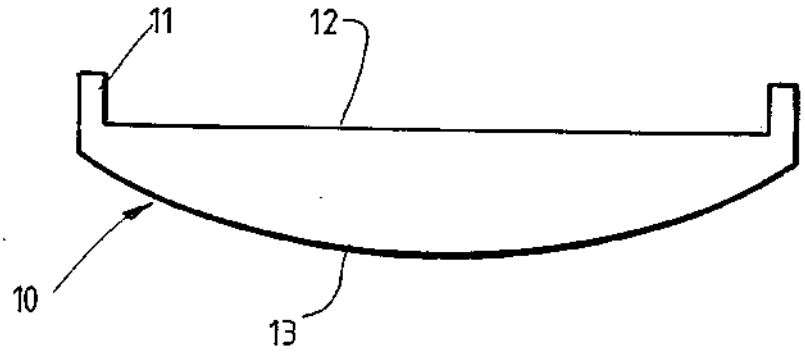

FIG. 2.

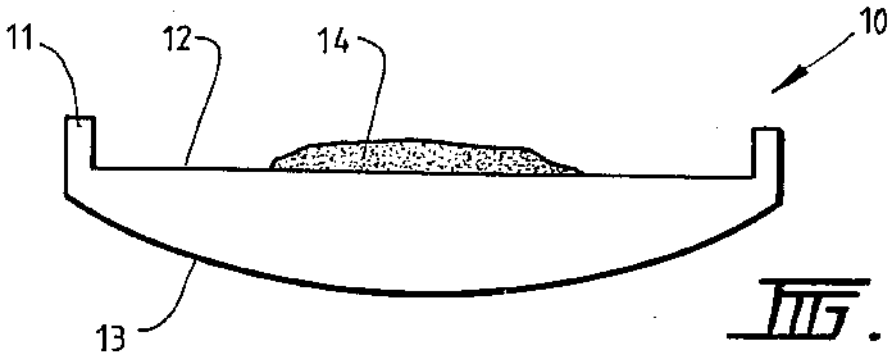

FIG. 3.

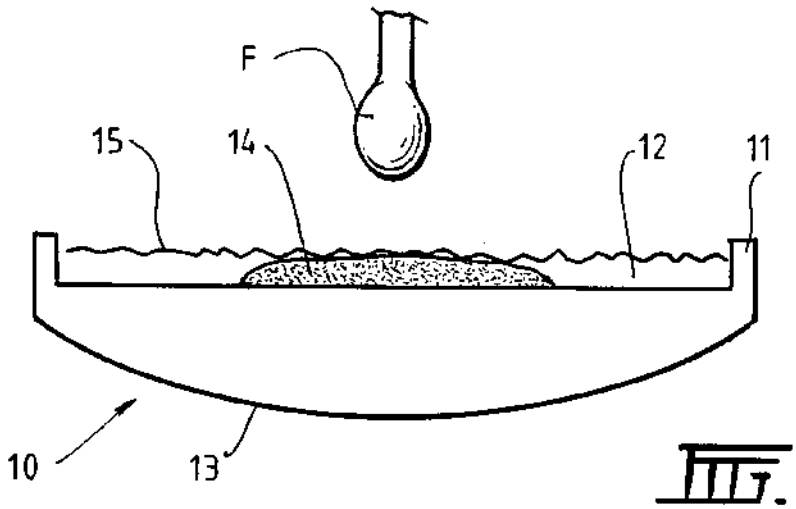

FIG. 4.

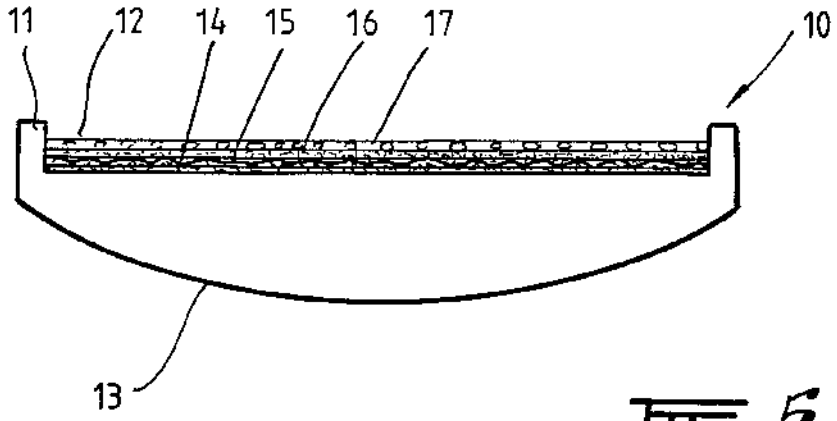

FIG. 5.

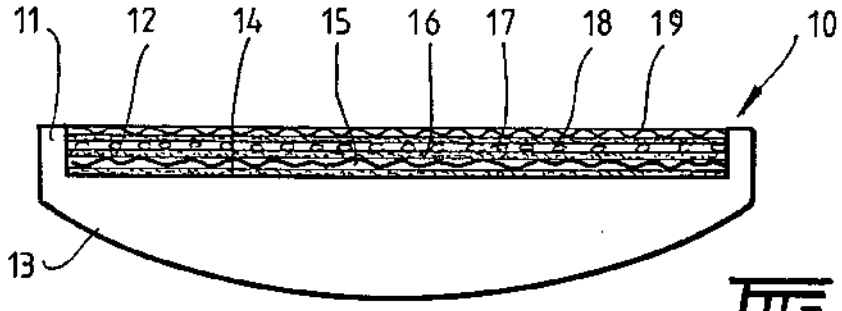

FIG. 6.

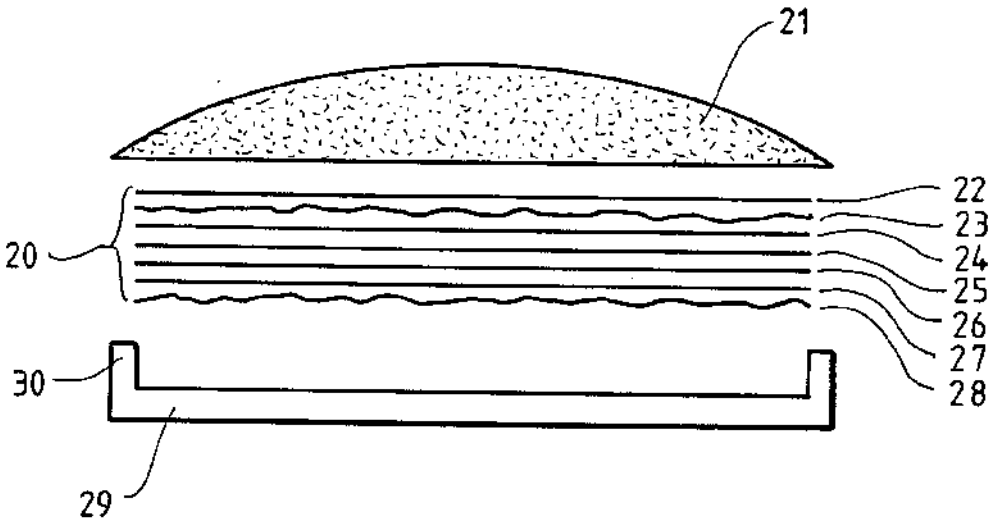

FIG. 7.

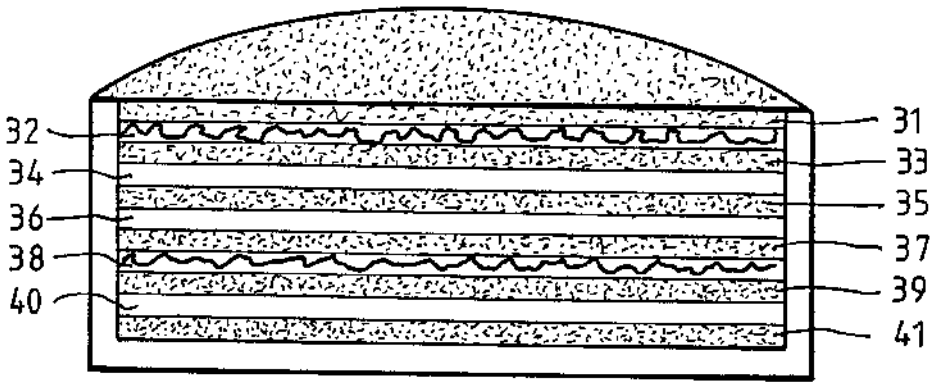

FIG. 8.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 95/00152

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl.[6] B44F 9/08, 1/14, B44C 3/02 A44C 27/00

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)
IPC B44F 9/08, 1/14 B44C 3/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC as above

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	EP 540335 A2 (YANG) 5 May 1993	
A	WO 92/22226 A1 (AUSTRALIAN GEM EXCHANGE PTY LTD) 23 December 1992	

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
25 May 1995	16 JUNE 1995 (16.06.95)
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929	Authorized officer S. K. Ghosh **S.K.GHOSH** Telephone No. (06) 2832163

Form PCT/ISA/210 (continuation of first sheet (2)) (July 1992) copIfm

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 95/00152

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
EP	540335	AU	26133/92	CA	2080666	CN	1064041
		JP	5215910	US	5294494		
WO	9222226	AU	19713/92	AU	88930/91	CA	3111243
		EP	597862				
							END OF ANNEX