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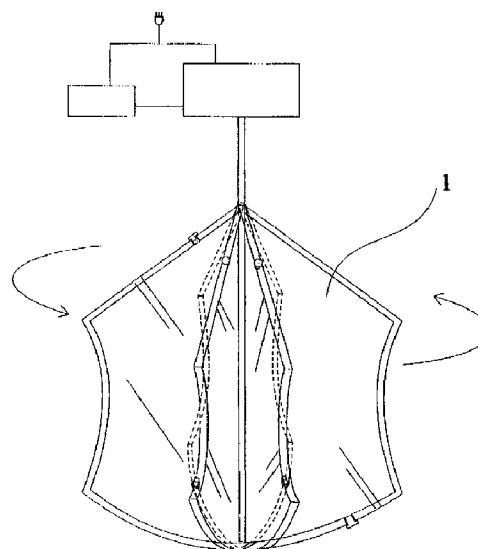
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(54) System for generating a virtual volume of light and related equipment

(57) This invention regards a system for generating a virtual volume obtained from a plane form, which emits or refracts the light in the dark or half-light and which originates from the rotation imparted to the plane figure around its axis. This makes it possible to create an effect of light and also to obtain the image of a solid body which can be observed by several people even when they are at different points of the room. This system lends itself to ornamental or advertising installations, as well as constructing pieces of furniture, decorating discotheques, aquariums, banks, museums and other places.

Fig. 5



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Description

Technical Field

[0001] This invention regards the technical field of interior lighting and the implementation of luminescent interior decoration accessories.

[0002] In particular, it concerns a system for generating a virtual volume obtained from a plane form, which emits or refracts the light in the dark or half-light and which originates from the rotation imparted to the plane figure around its axis.

[0003] This makes it possible to create an effect of light and also to obtain the image of a solid body which can be observed by several people even when they are at different points of the room, and without requiring particular concentration or attention of the observer who remains a simple on-looker.

[0004] This system lends itself to ornamental or advertising installations, as well as constructing pieces of furniture, decorating discotheques, aquariums, banks, museums and other places besides the use as an advertising and scenographic medium.

Background Art

[0005] At present, systems are known by means of which a three-dimensional optical effect or a virtual volume can be obtained, and which have a plane surface as a base and mainly used to construct pieces of furniture.

[0006] The systems known at present are represented by the holography which allows the observer of a plane surface to receive a sensation of depth or three-dimensionality, but have the drawback that this effect is only obtained from a particular angle of view and cannot be observed by several people simultaneously, as the effect is not created around the entire circle. Moreover, the known system does not generate an effect of light together with the three-dimensional effect.

[0007] Another known system to obtain this three-dimensional effect is a particular type of abstract painting with lines converging in such a way to supply an optical effect of volume when the observer stares at the plane surface concentratedly for a long time. These systems also have the drawback of compelling the observer to watch for a long time and with great concentration, which not everyone is able to do.

[0008] Other three-dimensional effects obtained from plane figures are known in the field of cinematography. These systems, although they are effective within their scope, are, however, often complicated and require highly developed equipment so that they are unsuitable to be produced at a low cost and on a small scale.

[0009] This invention aims at supplying a system to obtain a three-dimensional effect or a virtual volume from a plane figure without compelling the observer to watch the object from a particular angle or in a particular

way, as the only condition is the presence of half-light or darkness. The invention also has the aim of creating an effect of light and supplying a simple and easily used equipment for generating the desired effect.

[0010] This result has been obtained with the technical solution of using a plane shape corresponding to the section generating the solid figure (e.g. a rectangle in order to obtain a cylinder) of every form and size, with a double-layer, internally hollow structure made of transparent material (polymethyl methacrylate PMMA, glass, or other material), the inner chamber charged with liquid or paint or consisting of photosensitive single-material shapes, or painted shapes coated with a refracting film, or transparent full shapes with a chamber for a rechargeable cartridge, or shapes or profiles capable of reflecting the light, and which are rotated around their axes by an equipment connected as described in the independent claims. Other characteristics of the system are explained in the dependent claims.

Disclosure of Invention

[0011] Reduced to its essential structure, this system for generating a virtual volume according to the invention is characterised by the fact that the said volume is obtained by rotating a plane section around its axis, thus generating a corresponding solid figure which emits or refracts the light in the dark or half-light, and by the fact that it includes:

- means, by the rotation of which a volume is generated, with the shape of a transparent plane figure having the form of the section or half section of the corresponding solid figure, and capable of emitting or reflecting the light on its entire surface or only on its profile;
- means to light up the above-said figure, so that it emits or refracts the light, with a hollow space filled with fluorescent liquid or a solid surface made of refracting material, or with a refracting profile lit up by an external source of light;
- means to impart rotation to the figure around its axis, with a pivot connected with an actuator, preferably an electric motor, which, in turn, is connected with the axis of the figure spinning vertically, horizontally or diagonally depending on the type of effect to be obtained;
- possibly, means to make the figure move and rotate in harmony with a chosen piece of music, with a control unit activating the motor's movement according to the rhythm given by the music.

[0012] The figure (1) has the advantage that it is carried out by superposing two transparent plates, separated by suitable spacers along their rims, so that a hollow space forms between them, corresponding to the section of the figure to be displayed three-dimensionally, or by carving the same plate before it is interposed

with the other, no spacers being required in this case. In this case, the figure can be obtained directly and has the shape of the solid figure's section (Fig.1), or by using a larger plate, in which the shape of the plane figure is obtained by scarfing or superposing parts separated with spacers (fig.3).

[0013] The groove, corresponding with the figure obtained in one of the above-said ways, is conveniently filled, through an opening in the upper part of the shape (2), with a liquid solution consisting of parts of a phosphorescent multicolour pigmented base substance and other liquids with different viscosity, such as water, oils or similar, according to the densities desired and, consequently, the spectacular effects to be obtained during the machine's operation, whereas the reagent for activating phosphorescence, previously separated from the liquid base substance, is charged later by means of a manual or remote-controlled injector, so that the contact between the activating reagent and the liquid base produces a phosphorescent effect spreading inside the shape according to its outline, rotation rate and viscosity of the liquids contained in it.

[0014] Suitably, the described effect can last over the entire set time of reaction between the liquid base and the activating reagent, from 30 minutes to 12 hours on average, depending on the concentration of the substances and the spectacular effects desired (more light for less time and vice versa).

[0015] Conveniently, the shape can also be filled with a photosensitive liquid or a phosphorescent single component (paint or similar), i.e. charged by the light, and therefore does not need to be replaced every time, but guarantees continuous activation after each exposure to natural or artificial light.

[0016] Another advantage is the possibility to control the fluids' spreading inside the shape thanks to its subdivision in several chambers separated by injection holes drilled at different levels, so that the spreading of the liquids in the outer chambers can be controlled by regulating the rotation rate of the shape and, consequently, the centrifugal kinetic force imposed on the liquids which reach spilling levels only in particular periods of operation. A very intense stage effect can be obtained in this way, firstly forming one figure and then, as a consequence of rotation and spilling of the liquid into other chambers, different figures following one another.

[0017] Suitably, the shape can be filled and emptied manually through the inlet (2) and the outlet (3) respectively, or electronically by means of a circuit and remote-controlled solenoid valves (2) (3), so that the shape is filled and emptied at the very moment desired, in order to increase the stage light effect. The outflowing liquid forms a sort of fluorescent spiral on the floor, thus increasing the stage light effect. The shape must be filled with the liquids chosen each time before activating the equipment, in order to make the system work with this embodiment.

[0018] Conveniently, the figure can be obtained by moulding or other production processes, in the form of a single-material enbloc made of phosphorescent photosensitive polymer capable of emitting light in the dark or half-light and without being filled with a liquid, as hollow spaces are not planned for this embodiment.

[0019] Suitably, the figure may also consist of a transparent surface (preferably plexiglass) without hollow, the form of which corresponds to the section of the solid figure to be generated (fig.2), provided with a screened chamber (8) where the light cannot pass, preferably placed at the figure's centre, and which contains the tank of the liquid base of phosphorescent substance and of the reagent activating at the moment of use, so that the profile of the rotating shape is lit up thanks to particular materials' property of spreading light to the ends; the rotating shape's profile is lit up and generates the three-dimensional effect desired. In this case, the cartridge can easily be replaced from time to time.

[0020] Another advantage is that the figure can also be painted or coated with refracting adhesive films capable of reflecting the light sent out from narrow beam lamps (11) only directed on the shape concerned. In this case, the three-dimensional effect is obtained thanks to the figure's rotation and the light reflected by the shape's rotating surface. This is the only embodiment which provides for the use of an external source of light, whereas in all the other cases the effect of light is generated by a chemical reaction or by using a shape made of materials with a particular chemical composition, i.e. the light is an intrinsic part of the object and is self-supported.

[0021] With the latter embodiment, the shape can even be represented by its illuminated profile only, the rotation of which creates the same effect of volume. The figure's profile can also consist of a painted metal wire which can be modelled from time to time, in order to change each time the form of the solid figure generated.

[0022] Depending on the type of solid figure to be obtained, and especially for figures with an asymmetric section, parts of the plane figure must be ballasted with weights and counterweights to allow the figure to freely rotate around the pivot placed on its axis.

[0023] The rotating figure can suitably represent the entire section of the corresponding solid figure, or its half section, with a less intense effect of light in the latter case.

[0024] Conveniently, the figure rotates by means of a pivot connected to an electric motor, which is mounted on the figure's axis; this axis may be vertical, horizontal or diagonal depending on the type of figure and the type of effect to be obtained.

[0025] Another advantage is the fact that a specially designed circuit is capable of selecting different frequency ranges originating from any source of sound (noise, singing, musical instruments, recorded melodies or similar), transforming them into corresponding electric impulses; this circuit controls a motor, integrally con-

nected to the shape, which makes the shape rotate around its axis with a number of revolutions per minute proportional to the intensity of current supplied by the above-mentioned control unit. This system makes the shape move to the rhythm of music, creating a sort of dance of the figure obtained.

[0026] Suitably, the system comprises equipment consisting of an electric motor (5) supporting the figure (fig.2), or placed above (fig.2) held by a special bracket, or placed laterally depending on the case; this motor moves a pivot (4) fixed to the axis of the plane figure corresponding to the section of the solid figure to be obtained, and is supplied with current, the number of revolutions of the motor being preferably proportional to the intensity of current supplied by a control unit (6) which receives various frequency ranges generated by pieces of music and transforms them into electric impulses to be transmitted to the motor (5). The rotation imparted by the equipment to the figure creates a three-dimensional effect since the figure emits or refracts the light in one of the ways described above.

[0027] In practice, the details of execution may vary, being however equivalent, in form, size, arrangement of components, type of materials used, but still remain within the protected range of this application for an industrial patent.

Brief Description of Drawings

[0028] These and further advantages and characteristics of the invention can be easily understood by every expert in this field who reads the following description and refers to the drawings enclosed, giving practical examples of the invention, but not to be considered limited to them.

- Fig.1 schematically shows the system consisting of a plane figure (1) obtained by superposing two surfaces which form a hollow space corresponding with the figure's surface and obtained by interposing a spacer along the edges of the two surfaces or by scarfing the inside of the plate, the figure being provided with an inlet (2) with cap for filling in the fluorescent liquid and an outlet (3) with cap for discharging the same liquid. The axis (4) connected with the motor (5), and the unit (6) controlling synchronisation with music, both connected to the mains (7), can also be seen.
- Fig.2 shows a second embodiment, where the figure (1) is connected with the motor (5) and the control unit (6) by means of a pivot (4) and rotates around it. However, in this case, figure 1 is not filled with fluorescent liquid but consists of a transparent enbloc surface without any hollow space inside, but provided with a suitably screened chamber (8) preferably placed at the centre, in which a cartridge of a special liquid is inserted, lighting up the figure's entire profile thanks to the property of particular

materials (e.g. plexiglass) to spread the light to its ends, the rotating figure creating the same three-dimensional effect. In this case, the position of the observer is important; he or she must be placed in the same direction as the light in order to admire the effect.

- Fig.3 shows another scheme of an embodiment in which figure 1 is obtained by scarfing or superposing hollow parts separated with spacers inside a larger shape (9) which contains them. This figure is also filled with a liquid and can be emptied through the inlet (2) and outlet (3) respectively, whereas the unused portion of the shape is not filled with liquid and therefore does not participate in creating the effect of a virtual volume.
- Fig.4 shows another embodiment of the system described, where the figure consists of a white or, in any case, a refracting profile (10) which refracts the light sent out from an external source (11), so that the figure's rotation around its axis (4) generates the effect of a volume.
- Fig.5 shows an example of the figure's rotation around its axis; the rotation, together with the effect of spreading and refraction of the light by the shape, generating the effect of a virtual volume or three-dimensionality.

Claims

1. System for generating a virtual volume of light, characterised by the fact that the said volume is obtained by rotating a plane figure around its axis, which emits or refracts the light in the dark or half-light, and which corresponds to the section of the solid figure to be generated.
2. System according to claim 1, characterised by the fact that it comprises:
 - means, by the rotation of which a virtual volume of light is generated, with the shape of a transparent plane figure with the form of the section or half section of the corresponding solid figure, and capable of emitting or reflecting the light on its entire surface or only on its profile;
 - means to light up the figure, so that it emits or refracts the light, with a hollow space filled with fluorescent liquid, with a solid surface made of refracting material, with a refracting profile illuminated by an external source of light, or with a transparent plane surface, the profile of which is provided with a chamber for a rechargeable cartridge of fluorescent color;
 - means providing for the figure's rotation around its axis, with a pivot connected with an actuator, preferably an electric motor, which, in turn, is connected with the axis of the figure spinning

vertically, horizontally or diagonally depending on the type of effect to be obtained;

- possibly, means to make the figure move and rotate in harmony with a particular music, with a control unit connected with the motor which moves the figure according to the rhythm given by the music.
3. System according to claim 1 or 2, characterised by the fact that the plane figure (1), whose rotating creates the volume, has a hollow space inside, corresponding with the surface of the entire or part of the solid figure's section to be obtained, both created directly (fig.1) or using a larger plate, in which the shape of the plane figure is obtained by scarfing or superposing parts separated with spacers (fig.3). 10
 4. System according to claim 3, characterized by the fact that a groove, corresponding to the figure, is previously filled manually or by means of a solenoid valve, through an inlet in the upper part of the shape (2), with a liquid base solution consisting of multicolor phosphorescent pigments and other liquids with different viscosity, such as water, oils or similar, whereas the reagent for activating phosphorescence, previously separated from the liquid base substance, is charged later by means of a manual or remote-controlled injector, so that the contact between the activating reagent and the liquid base produces a phosphorescent effect spreading inside the shape according to its outline, rotation rate and viscosity of the liquids contained in it. 20 25 30
 5. System according to claim 4, characterized by the fact that the shape can also be filled with a photosensitive liquid or a phosphorescent single component (paint or similar), i.e. charged by the light, and must therefore not be replaced every time, but guarantees continuous activation after each exposure to natural or artificial light. 35 40
 6. System according to one or several of the above claims, characterised by the fact that the shape can be divided internally into several chambers separated by injection holes drilled at different levels, so that the spreading of the liquids in the outer chambers can be controlled by regulating the rotation rate of the shape and, consequently, the centrifugal kinetic force imposed on the liquids which reach spilling levels only in specific periods of operation, firstly forming one figure and then, as a result of rotation and spilling of the liquid into other chambers, different figures following one another. 45 50
 7. System according to claim 3, characterised by the fact that the shape can be filled and emptied manually through the inlet (2) and the outlet (3) respectively, or electronically by means of a circuit and remote-controlled solenoid valves (2) (3), so that the shape is filled and emptied as and when desired.
 8. System according to claim 1 or 2, characterized by the fact that figure 1 can be obtained by moulding or other production processes, in the form of a single-material enbloc made of phosphorescent photosensitive polymer capable of emitting light in the dark or half-light and without filling a liquid into a hollow space. 5
 9. System according to claim 1 or 2, characterised by the fact that the figure may also consist of a transparent surface (preferably plexiglass), the form of which corresponds to the section of the solid figure to be generated (fig.2), provided with a screened chamber (8) where the light cannot pass, preferably placed at the figure's centre, and which contains the tank of the liquid base of phosphorescent substance and of the reagent activating at the moment of use, so that the profile of the rotating shape is illuminated and produces the three-dimensional effect desired, and the cartridge can easily be replaced from time to time. 15
 10. System according to claim 1 or 2, characterised by the fact that the figure can also be painted or coated with refracting adhesive films capable of reflecting the light sent out from narrow beam lamps (11) only directed on the shape concerned. 25
 11. System according to claim 1 or 2, characterised by the fact that the shape can also be represented by its illuminated profile only, the rotation of which creates the same effect of volume. The figure's profile can also consist of a painted metal wire which can be modelled from time to time, in order to change each time the form of the solid figure generated. 30
 12. System according to one or several of the above claims, characterised by the fact that, depending on the type of solid figure to be obtained, and especially for figures with an asymmetric section, parts of the plane figure are ballasted with weights and counterweights to allow the figure to freely rotate around the pivot placed on its axis. 35
 13. Equipment for activating the system claimed above, consisting of an electric motor (5) supporting the figure (fig.2), or placed above (fig.2) held by a special bracket, or placed laterally depending on the case; this motor moving a pivot (4) fixed to the axis of the plane figure corresponding to the section of the solid figure to be obtained, and is supplied with current, the number of revolutions of the motor being preferably proportional to the intensity of current supplied by a control unit (6) which receives 40 45 50 55

various frequency ranges generated by pieces of music and transforms them into electric impulses to be transmitted to the motor (5). The rotation imparted by the equipment to the figure, emitting or refracting the light, creates the three-dimensional effect of a virtual volume. 5

14. Equipment according to claim 13, characterised by the fact that a circuit, capable of selecting different frequency ranges originating from any source of sound and transforming them into corresponding electric impulses, controls a motor, integrally connected to the shape, which makes the shape rotate around its axis with a number of revolutions per minute proportional to the intensity of current supplied by the above-mentioned control unit. 10 15

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Fig. 1

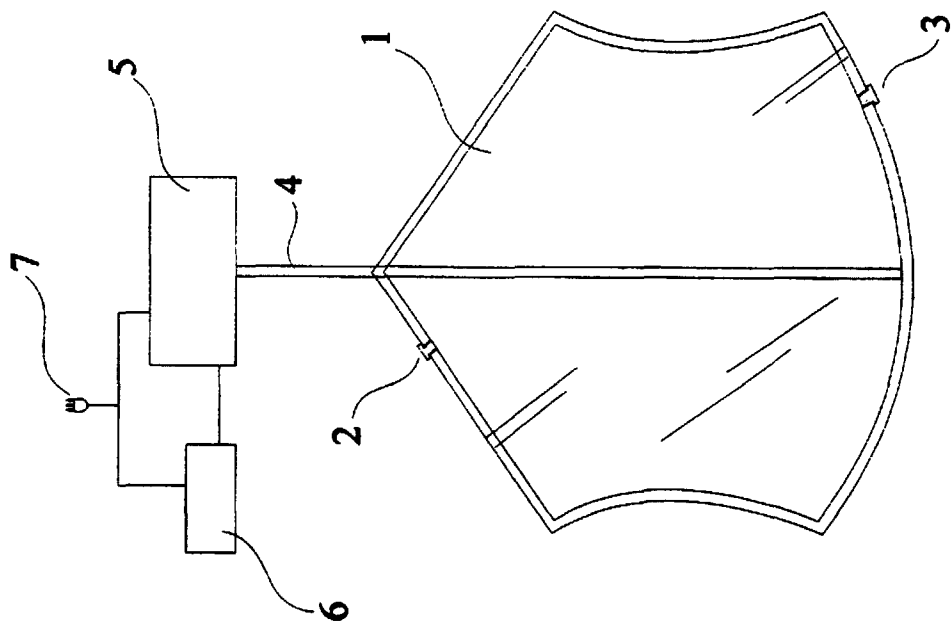


Fig. 2

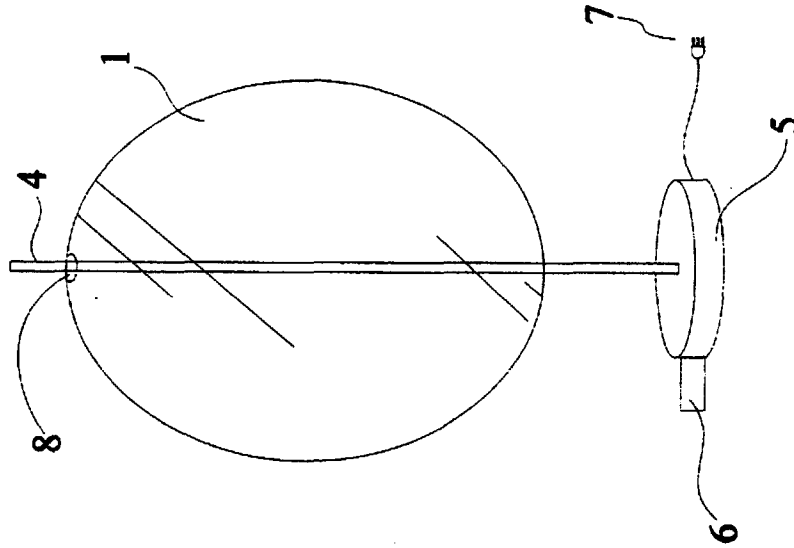


Fig. 3

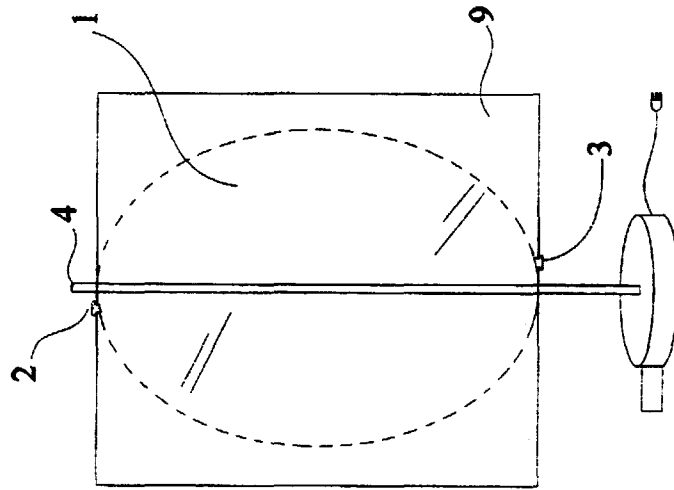


Fig. 4

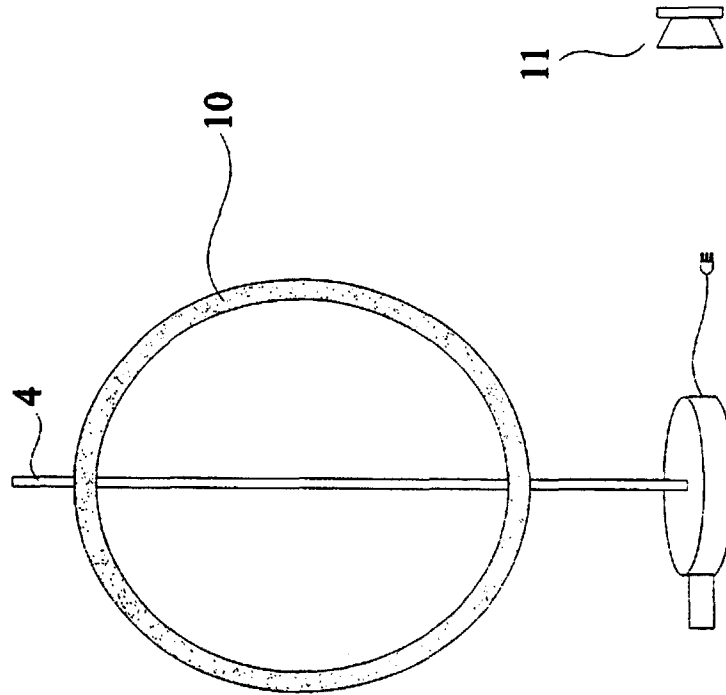
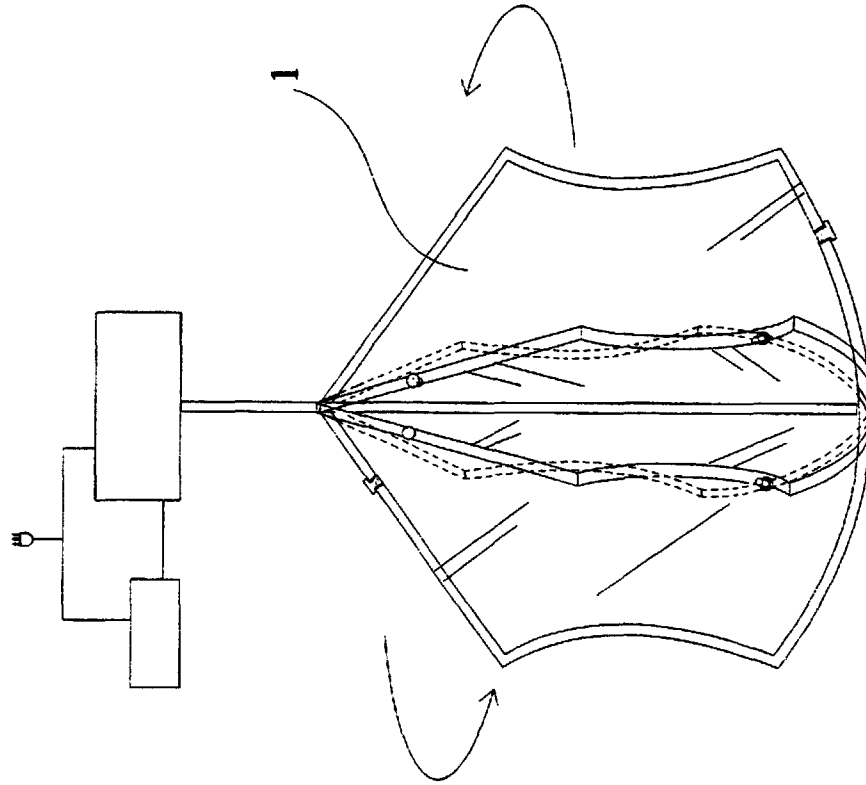


Fig. 5





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EUROPEAN SEARCH REPORT

Application Number
EP 98 12 2490

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 4 008 534 A (SWARTZ) 22 February 1977 * column 2, line 32 - line 61 * * column 3, line 50 - column 4, line 24 * * column 4, line 61 - line 66 * * column 5, line 9 - line 14 * * figures 1,2,4 *	1,10,11	F21P3/00
Y	---	13,14	
X	GB 2 187 588 A (COULTHARD) 9 September 1987 * page 1, line 91 - line 124 * * figures 1-4 *	1	
Y	FR 2 653 857 A (PERROT) 3 May 1991 * page 3, line 26 - page 5, line 9 * * figures 1,2 *	13,14	
A	---	1	
A	DE 20 51 190 A (REMY ET AL.) 20 April 1972 * page 7 - page 10 * * figures 1-4 *	1-9	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F21P G09F A63H F21V
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		9 March 1999	De Mas, A
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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 12 2490

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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09-03-1999

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4008534	A	22-02-1977	NONE	
GB 2187588	A	09-09-1987	NONE	
FR 2653857	A		NONE	
DE 2051190	A		NONE	