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(54) Synchronously coaxially collapsible modular construction for illumination engineering

(57) A synchronously coaxially collapsible modular construction for illumination engineering comprises a rotary ring element (2) and modular units including contoured plate-like elements (3) pivoted to the ring element (2) to be rotated to modify their mutual positions.

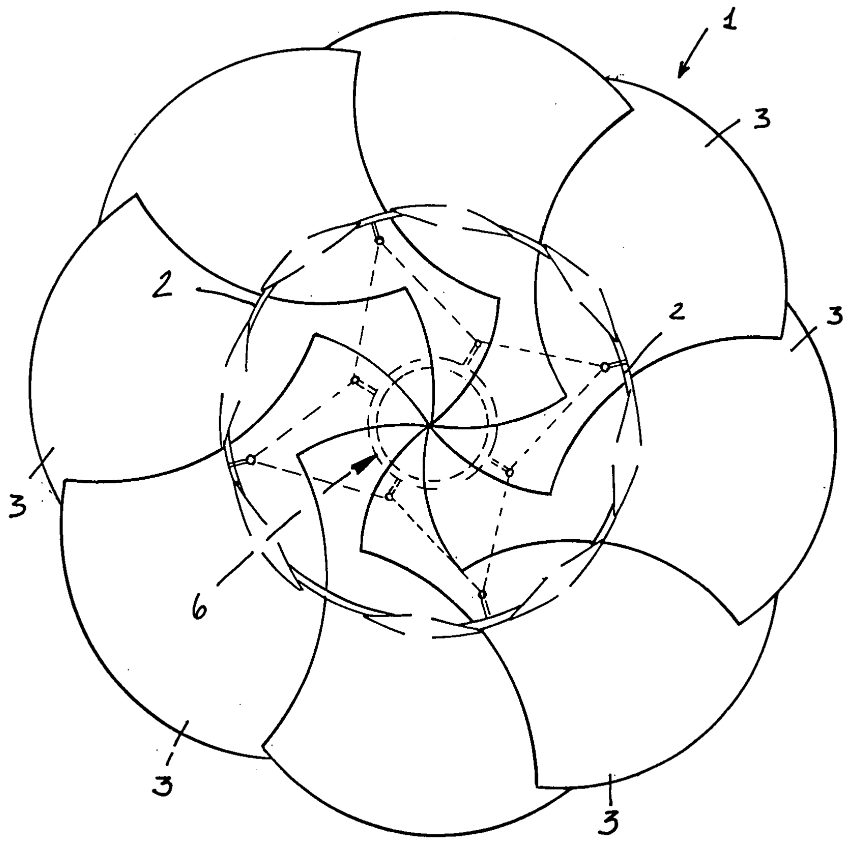

FIG. 1

EP 1 835 225 A1

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a synchronously coaxially collapsible modular construction for illumination engineering.

[0002] Several lamps for projecting either direct or diffused light, owing to the rotary movement of a lamp shade are already known.

[0003] However, prior lamps of the above mentioned type are affected by a lot of drawbacks, both of a construction and operational nature.

[0004] For example, some prior lamps compels the user to operate on the light source, with a risk of contacting dangerous live electric parts.

[0005] Moreover, the above mentioned prior lamps conventionally comprise metal components, which, as is known, in an electric field generate dangerous magnetic fields.

[0006] Yet another drawback of metal components included in the above mentioned prior lamps, is that used and scrape metal parts require a comparatively high power consume to be transformed and recycled.

[0007] Yet another drawback of said prior lamps is their assembling cost, storing and transport space, and a rather difficult constant supply or delivery of the lamps.

SUMMARY OF THE INVENTION

[0008] Accordingly, the aim of the present invention is to provide a modular construction for illumination engineering which overcome the above mentioned problems affecting the prior art.

[0009] Within the scope of the above mentioned aim, a main object of the invention is to provide such a modular construction designed for continuously varying the direct and diffused light rate as provided by a point-like light source, without the need of displacing the light source, and, consequently, without contacting dangerous electric parts, but merely modifying the light path.

[0010] Another object of the present invention is to provide such a modular construction for illumination engineering which does not use metal parts, for its assembling, and, which, being of modular nature, may be constructed starting from any desired plate-like material, thereby allowing both the maker and the consumer to choose, depending on specific requirements, a preferred configuration, and facilitating the disassembling of the modular construction, for example for cleaning or disposal off purposes.

[0011] Yet another object of the present invention is to provide such a modular construction for illumination engineering which has a very low assembling cost and allows to reduce its shipment and storing spaces, while providing a constant possibility of easily choosing and assembling components having any desired configuration and colors.

[0012] According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by a synchronously coaxially collapsible modular construction for illumination engineering, characterized in that said construction comprises a rotary ring element and modular units including contoured plate elements pivoted to said ring element, to turn in order to modify the related position thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Further characteristics and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment of the invention, which is illustrated, by way of an indicative, but not limitative, example, in the accompanying drawings, where:

Figure 1 is a top plan view of a modular construction according to the invention, including a plurality of side-pushed or driven modules;

Figure 2 shows a laterally driven module having the structure of the preceding figure;

Figure 3 is a perspective view showing the side pushed module construction, at a closed position thereof;

Figure 4 is a further perspective view, similar to figure 3, showing the construction in an open position;

Figure 5 is a top plan view of a modular construction according to the present invention, including a plurality of double-push modules;

Figure 6 shows a double-push module of the construction shown in figure 5;

Figure 7 is a further perspective view, showing the double-push modular construction, represented in a closed position or condition thereof;

Figure 8 is a further perspective view, similar to figure 7, but showing the construction at an open position thereof;

Figure 9 is a side elevation view, showing a self-centering hanging or supporting system;

Figure 10 is a top plan view of said self-centering hanging system;

Figure 10 is a further perspective view showing a sheave assembling used in cooperation with a resilient cable or rope;

Figure 12 is a further perspective view, showing an annular through element, used with an undeformable cable;

Figures 13, 14 and 15 show a possible use of the modular construction according to the present invention, in three different light diffusion positions;

Figures 16 and 17 schematically show a system for forming the cone assembly included in the modular construction according to the present invention;

Figure 18 shows a constructional diagram of the side-pushed module construction;

Figure 19 shows a constructional diagram for the double-push module construction; and

Figures 10, 21 and 22 are schematic view showing a plurality of constructional modules which can rotate about a ring element by a driving side pushing.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] With reference to the number references of the above mentioned figures, the modular construction according to the present invention, which has been generally indicated by the reference number 1, comprises, as essential component parts thereof, a ring element 2 and modular units comprising plate-like elements 3 which are pivoted to said ring element 2, thereby they can turn in order to modify their related positions.

[0015] The above mentioned modular units are constructed, and the rotary system is chosen, based on the following characteristics.

[0016] More specifically, it is necessary to choose at start the general proportions or size of the lamp shade, and the rotary movement pattern to be performed by the modular units, considering that the rotary ring element is specifically designed for receiving therein the light diffusing units supported by a self-centering supporting system.

[0017] According to one aspect of the invention, the modular units cannot perform revolutions greater than 360°.

[0018] The dimensions of the cone or cylinder assembly, or its size, in particular, are chosen also considering the dimensions of the light diffuser or diffusers, and of the heat provided thereby (the safety properties being designed based on the materials provided for forming the modular units).

[0019] Thus, with reference to figures 16 and 17 it is possible to set the following parameters:

M = apothem of the cone which represents the vertical distance of the two closure points on the modular units.

A = apothem revolution angle for a conical generation.

[0020] The modular unit is made essentially based on the number of parts the base diameter of the cone must be divided into.

[0021] In choosing the number of parts for constituting the modular unit, we must consider the fact that by increasing the modular unit number, then:

- the overall stiffness of the system will increase,
- the overall weight of the system will increase,
- the accuracy of the system will also increase,
- the spacing amount M2 of each modular unit will decrease.

[0022] Starting from the polygon including a set number n of modular units and arranged at a middle line, with respect to the base diameter, the distance amount M2 of the modular units 3, corresponding to the polygon sides, as well as the modular unit size will be calculated, by dividing the base diameter into n equal parts M3.

[0023] Then, it is necessary to select the diameter dn and the diameter d1:

[0024] As already stated in the introductory part of the disclosure, the pushing movement or driving of each modular unit on a following one can be of two types: of a double-pushing type or of a side pushing type, while holding the cone size to be formed constant.

[0025] For the above two mentioned types, we will have, as it will be disclosed in a more detailed manner hereinafter, rotary ring elements including different core diameters (dn).

[0026] By dividing into two equal parts the circle portion M3, and by tracing or marking a diameter passing through two of the four central crossing points, with respect to a side of the polygon M2, we will obtain an axis of diameter dn of the rotary ring element for double-push modular units.

[0027] By dividing into four equal parts the circle portion M3 and marking a diameter passing through three of the four central crossing points, with respect to the same side of the polygon M2, we will obtain the axis of diameter dn of the rotary ring element for side-push modular units.

[0028] In both cases, it is necessary to establish that the rotary ring element diameter d1 does not interfere against the modular unit rotary movement, that is that the ring element passes twice through the modular unit, thereby providing a rotary pivot or "pintle".

[0029] By marking an ellipse passing through the crossing points of the modular unit crossing the inner diameter of the rotary ring element and inner quadrant thereof, perpendicular to the rotary axis of the modular unit, we will obtain the width M4, for double-pushed modular units, and M6 for the laterally pushed modular units.

[0030] By further marking an ellipse passing through the crossing points of the modular units crossing the inner diameter of the rotary ring element and the inner quadrant thereof, perpendicular to the rotary axis of the modular unit, we will obtain the width M5, for the double-push modular units, and M7, for the laterally pushed modular units.

[0031] As disclosed, the different pushing or thrust types, while holding the distance amount M2 between the modular units constant, define several parameters for constructing the pivot or pintle said modular unit turns about.

[0032] The thickness, finishing details and contour or profile of the modular units will be set as follows.

[0033] Up to now, the thicknesses of the modular units have been considered as zero, to provide an empirical formula for making the contours and pintle or pivot points.

[0034] It should be pointed out that this has been deliberately selected, since, anyhow, the pivot design is so constructed as to allow the modular units to perform a rotary movement through 360°.

[0035] As the modular unit thickness or diameter d1 of the ring element 2 increase, then will increase the friction and flexure affecting said modular units, and, accordingly, it will be necessary to use them as selected by us to provide the desired stiffness for the system.

[0036] Each modular unit will provide and receive induced or friction equal forces, as generated by adjoining modular units.

[0037] It is necessary that the friction forces allowing the system to be locked at a desired position do not interfere against the system stiffness and, in the meanwhile, do not irreversibly spoil or deform the modules.

[0038] Owing to the resilient properties of the used materials and its surface finishing pattern, the inlet contour is herein adopted, that is that part of the modular unit which slides inside the following module, thereby providing the desired or target stiffness.

[0039] Each modular unit overlaps adjoining modular units to hold friction and locating forces constants, or to conceal, from outside, the rotary ring element 2.

[0040] The diffuser 4 is arranged inside the rotary ring element, possibly engaged on the same axis of the cone, thereby not to interfere against the rotary movement of the modules.

[0041] The number of diffusers may also be greater than 1.

[0042] Accordingly, it is necessary to evaluate if the diffusers must be arranged either in vertical or in horizontal position, and arrange the electric and hanging cable 5 of the overall system so that it does not hinder the rotary and closing movements of the modules.

[0043] The problem of properly locating the diffusers at a central portion, with respect to the lamp shade, and arrange the lamp shade in a horizontal position, with respect to the horizontal plane, is solved by the above mentioned self-centering supporting or hanging system.

[0044] Inside the lamp shade are provided parts of the rotary ring element, arranged between the modular units, which can be freely used for connecting the return of the diffusers, and which, accordingly, can be used for hanging or supporting the overall construction.

[0045] The overall insulating and self-centering hanging or supporting system, generally indicated by the reference number 6, may be of a type similar to that used for supporting it, while providing insulation from outer contacts (ground to the earth) the professional microphones, by using a cable (either elastic or not) allowing to support and properly align the subject construction.

[0046] Accordingly, the lamp shade can be assembled and disassembled at will, without causing the user to contact electric live parts and without the need of performing fixed assembling operation, which would require additional labour and which would not allow to provide the constructional single elements to be disassembled.

[0047] By using a suitably dimensioned or designed cable 7, for supporting the system weight, having a closed ring pattern, and adapted to slide inside the passing through elements 8, it will be sufficient to slightly displace the lamp shade to achieve the target position.

[0048] If an elastic or resilient cable 9 is used, then a sheave system 10 designed for automatically self-centering the above disclosed construction, as shown by way of an example in figure 11 will be used.

[0049] It has been found that the invention fully achieves the intended aim and objects.

[0050] In fact, the invention provides a system allowing to easily change the direct and diffused light rate, as provided by a point-like source, without the need of displacing the light source, and accordingly without contacting electric live parts, but merely modifying the light flow path.

[0051] Moreover, the construction according to the present invention does not provide to use, for assembling it, metal parts.

[0052] Furthermore, since the construction is of a modular nature, it can be made starting from any desired plate material, thereby allowing both the maker and the user to select it based on its contingent requirements, while allowing the construction to be easily disassembled, at any desired time, for cleaning, moving or disposing off it.

[0053] The used flat elements, moreover, can be subjected to any desired surface treatments, thereby providing nearly infinite operating possibility, in particular in the case of wood laminated materials.

[0054] For example, in addition to the very high number of commercially available types of laminated material, the latter could be additionally impregnated by any desired coloring material.

[0055] Furthermore, since the component elements are of modular nature, the pre-selling assembling cost is very small, as well as the shipment and storing space, while allowing the users to be supplied with a constant delivery pattern, and to freely choose modular units including target configurations and colors.

[0056] In particular, the modules can be assembled in the desired direction and from the desired side.

[0057] For example, modules having differently asymmetrical patters, colors or finishings on the two surfaces (x,y) thereof, would provide up to three different combinations: x-x-x-.../y-y-y-.../x-y-x-y...

[0058] With respect to simplified processing operation, it is possible to provide a synchronous modular rotary movement, even by using a single pivot passing through a single hole (∅d1) provided in the module.

[0059] This type of module, which could be called of a "vertical push or thrust" type, would have the following characteristics:

- HEIGHT: (∅M) equal to the apothem of the cone to be created;
- WIDTH: (>M3) to be calculated considering the number of modules and then dividing the base circumference of the cone to be generated by the number of the module to be used, by providing an

increase directly proportional to the flexibility of the material;

- SPACER ELEMENTS: to be calculated or designed by considering the number of modules and their thicknesses, and then dividing the rotary circumference for the number of modules to be used, and subtracting the thickness of the plate or metal sheet element from the resulting amount, we will obtain the suitable width of the spacing element, which spacer elements will be chosen in a number equal to that of the modular units, and can also be formed by cutting through or trimming the modular unit itself.

[0060] Differently from the side or double pushing type of modules, the cross section of the vertical push module type must be perpendicular to the rotary axis (in cross sectional B-B) and substantially tangent thereto (in cross section A-A and C-C) to provide the synchronous rotary movement.

[0061] Accordingly, the modular units can be formed or modified by extruding, calendaring, twisting, thermoforming, bending and so on operations.

[0062] The flexibility of the module forming material will aid the movements of said modules, and this by reducing the cone closing/opening operation frictions.

[0063] In this connection it should be apparent that the bending, twisting, calendaring and so on pattern can change, and may be a continuous one, in a single direction, or an alternating one symmetrical with respect to the axis of the rotary ring element.

[0064] In particular, depending on the direction (either singular or double), the module will operate as a side push system (in a case of a single direction), or as a double-push system (in a case of double symmetrical directions).

[0065] Finally, it should be pointed out that the subject synchronously coaxially collapsible modular construction for illumination engineering has been specifically designed to provide, with a minimum number of parts and processing operations, several functions which can be simultaneously performed.

[0066] In practicing the invention, the used materials, together with the contingent size and shapes, can be any, depending on requirements.

Claims

1. A synchronously coaxially collapsible modular construction for illumination engineering, **characterized in that** said construction comprises a rotary ring element and modular units including contoured plate elements pivoted to said ring element, thereby said modular units can be rotated to modify their mutual positions.

2. A modular construction, according to claim 1, **characterized in that** inside said rotary ring element a light diffuser, supported by a self-centering supporting system is arranged.

3. A modular construction, according to claim 1 or 2, **characterized in that** said modular units perform revolution movements up to 360°.

4. A modular construction, according to one or more of the preceding claims, **characterized in that** said modular constructions form a cone, the apothem whereof represents a vertical distance of the two closure points on said modular units.

5. A modular construction, according to one or more of the preceding claims, **characterized in that** each said modular unit is constructed based on the number of parts the cone base diameter is to be divided into.

6. A modular construction, according to one or more of the preceding claims, **characterized in that** owing to the structure of the polygon, including a set number of modular units, arranged on a middle line with respect to the base diameter, the spacing amount of said modular units corresponds to the length of the polygon sides, and the size of the module is obtained by dividing the base diameter into a number of parts equal to the number of said modular units.

7. A modular construction, according to one or more of the preceding claims, **characterized in that** the pushing movement of each said modular unit on a following modular unit is of two types: of a double pushing or a side pushing type.

8. A modular construction, according to one or more of the preceding claims, **characterized in that**, by dividing into four equal parts the circle portion and marking a diameter passing through two of the four central crossing points with respect to a side of the polygon, is defined the axis of the diameter of the rotary ring element for double-push modular units.

9. A modular construction, according to one or more of the preceding claims, **characterized in that**, by dividing into four equal parts the circle portion, and marking a diameter passing through three of the four central crossing points, with respect to the same side of the polygon, is defined the diameter of the rotary ring element for side-push modular units.

10. A modular construction, according to one or more of the preceding claims, **characterized in that**, by marking an ellipse passing through the crossing points of the modular unit crossing the outer diameter of the rotary ring element and through the outer quadrant thereof, perpendicular to the rotary axis of the

modular unit, is defined a width for the double-push modular units, and a corresponding width for the side-push modular units.

11. A modular construction, according to one or more of the preceding claims, **characterized in that**, by marking an ellipse passing through the crossing points of the modular unit crossing the inner diameter of the rotary ring element and the inner quadrant of the latter, perpendicular to the rotary axis of the modular unit, is defined a width for the double-push modules, and a corresponding width for the side push modular units.

12. A modular construction, according to one or more of the preceding claims, **characterized in that** as the thickness of the modular unit or the cross-section of the ring element are increased, then also increase the friction and flexure force on said modular units, to be used to provide a target stiffness of the system.

13. A modular construction, according to one or more of the preceding claims, **characterized in that** each said modular unit provides and receives statically equal induced or friction forces, to/from adjoining modular units, said friction forces allowing the system to be locked at a desired position.

14. A modular construction, according to one or more of the preceding claims, **characterized in that**, depending on the elastic properties of the used material and its surface finishing, the inlet contour, or that portion of the modular unit inside sliding on a following modular unit, to provide the desired stiffness, is thereby adopted.

15. A modular construction, according to one or more of the preceding claims, **characterized in that** each said modular unit overlaps adjoining modular units to provide constant friction and locating forces, or to conceal, to the outside, said rotary ring element.

16. A modular construction, according to one or more of the preceding claims, **characterized in that** said modular construction comprises at least a diffuser arranged inside said rotary ring element and on the same axis of the cone, so as not to interfere against a rotary movement of said modular units.

17. A modular construction, according to one or more of the preceding claims, **characterized in that** the supporting insulating and self-centering system is of a type similar to that used for supporting and insulating from outer contacts professional microphones, by using a cable, either resilient or not, allowing to support and level said construction.

18. A modular construction, according to one or more of the preceding claims, **characterized in that** said modular construction comprises a resilient rope element and a sheave system for automatically self-centering said modular construction.

19. A modular construction, according to one or more of the preceding claims, **characterized in that** said modular construction comprises vertical-pushed modules, having a cross section perpendicular to the rotary axis and substantially tangent to said rotary axis to provide a synchronous type of rotary movement.

20. A modular construction, according to one or more of the preceding claims, **characterized in that** said modular units are formed or modified by extruding, calendaring, twisting, thermoforming or bending methods.

21. A modular construction, according to one or more of the preceding claims, **characterized in that** the bending, twisting, calendaring pattern is a continuous pattern either in a single direction or in an alternating direction symmetrical with respect to the axis of the rotary ring element.

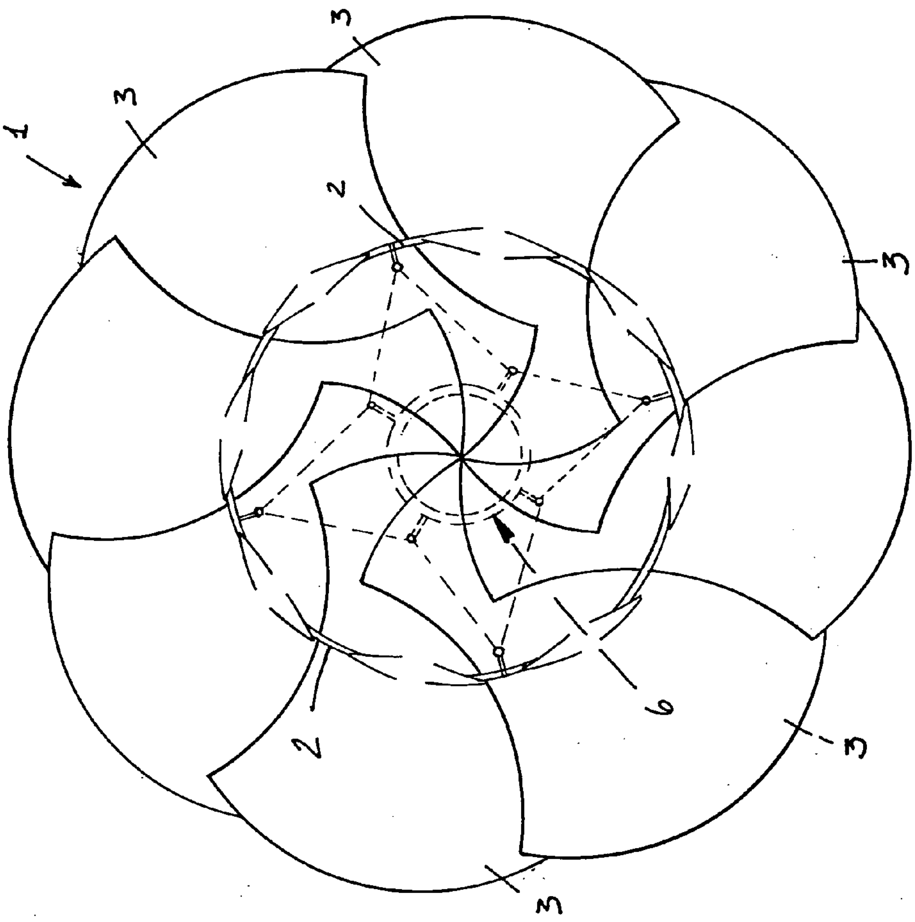

FIG. 1

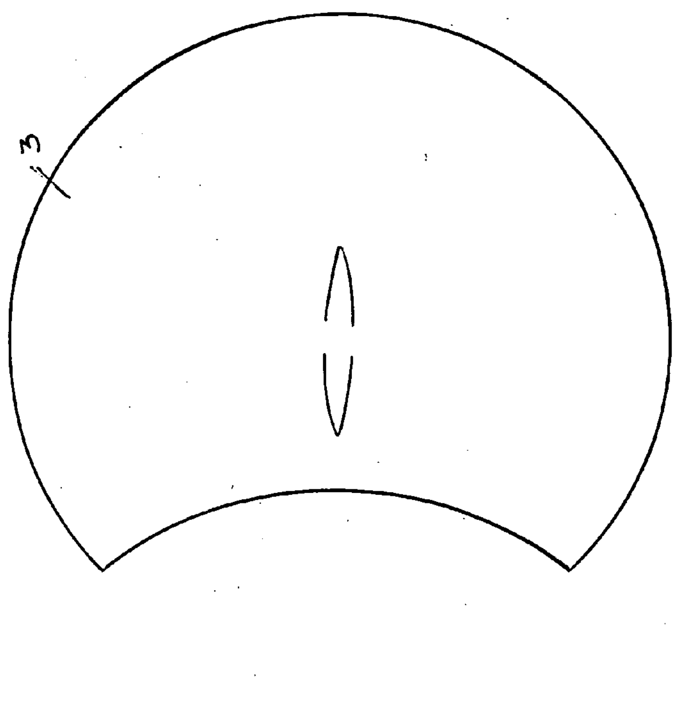

FIG. 2

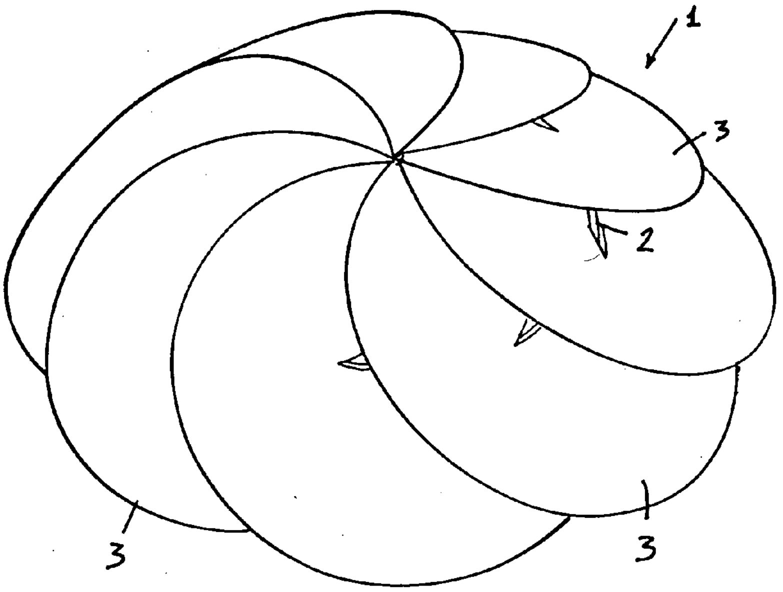

FIG. 3

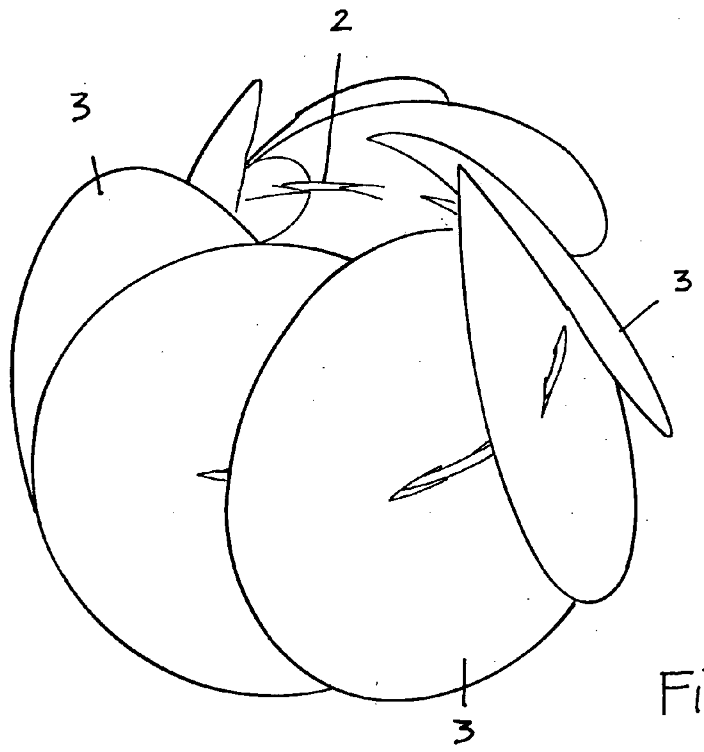

FIG. 4

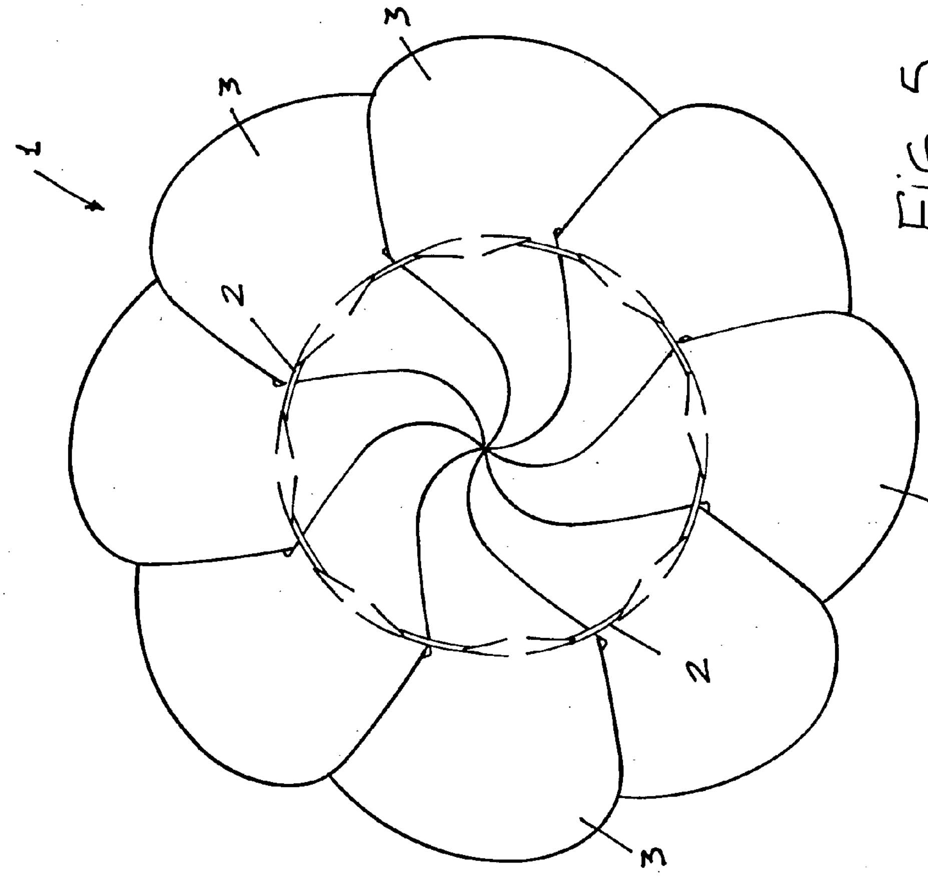

Fig. 5

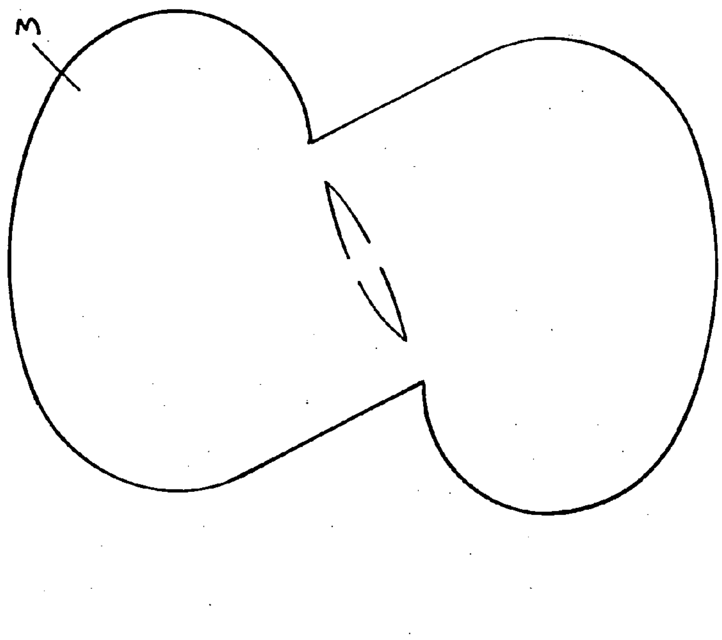

Fig. 6

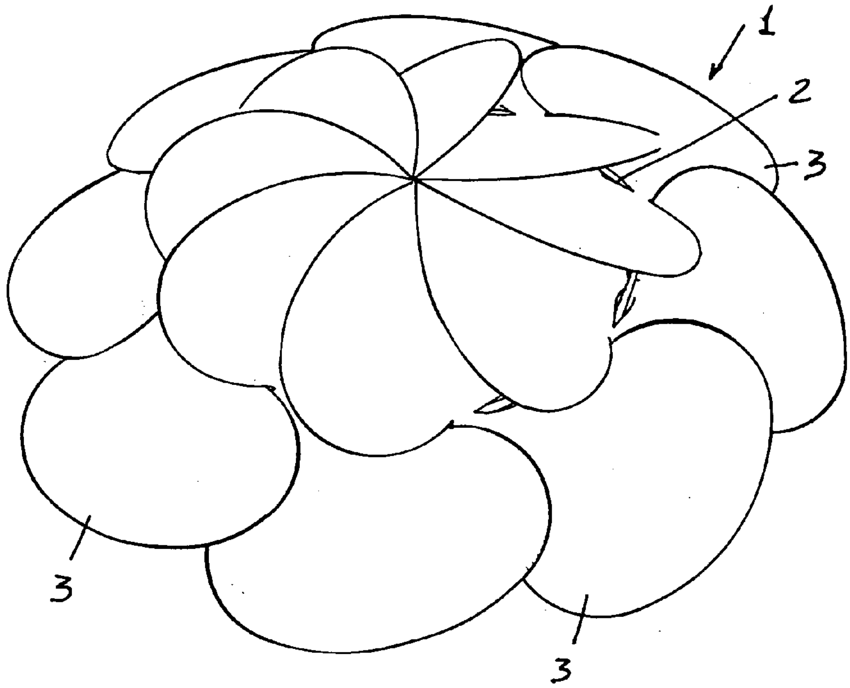

FIG. 7

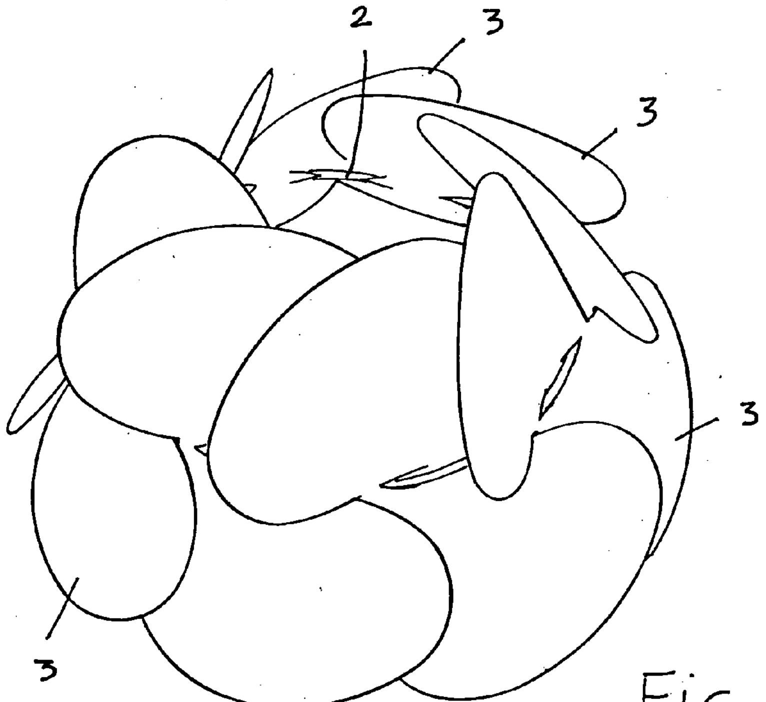

FIG. 8

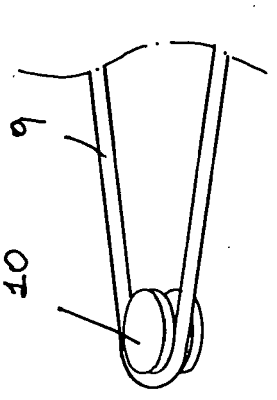

FIG. 11

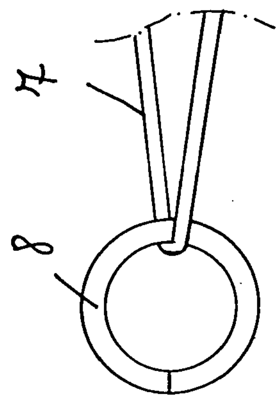

FIG. 12

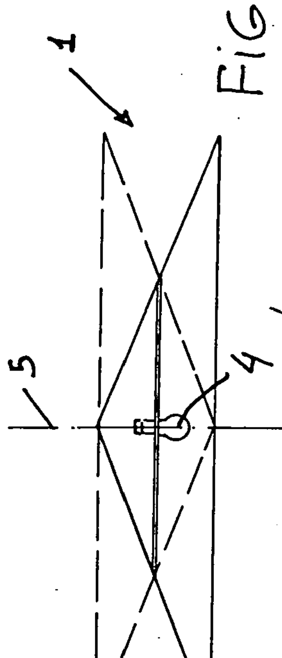

FIG. 9

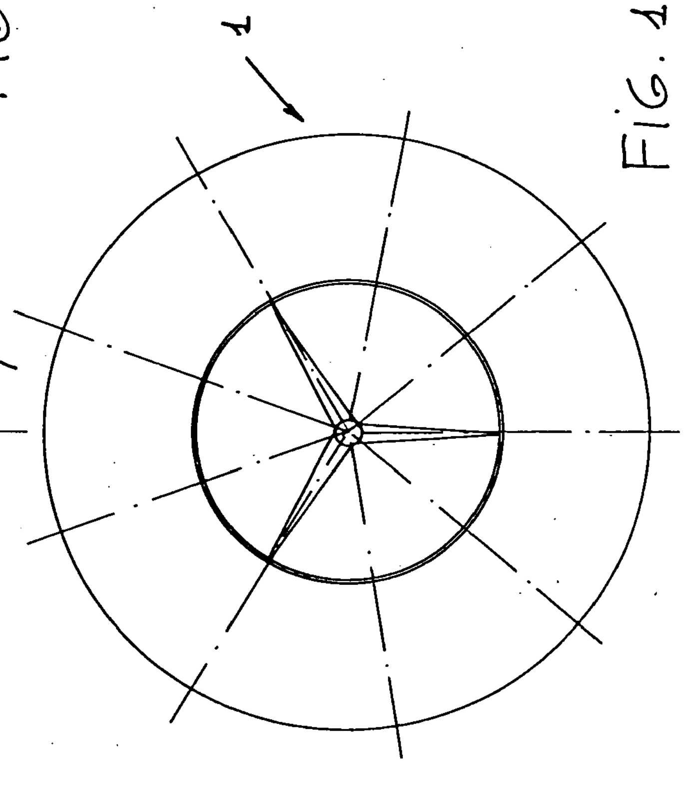

FIG. 10

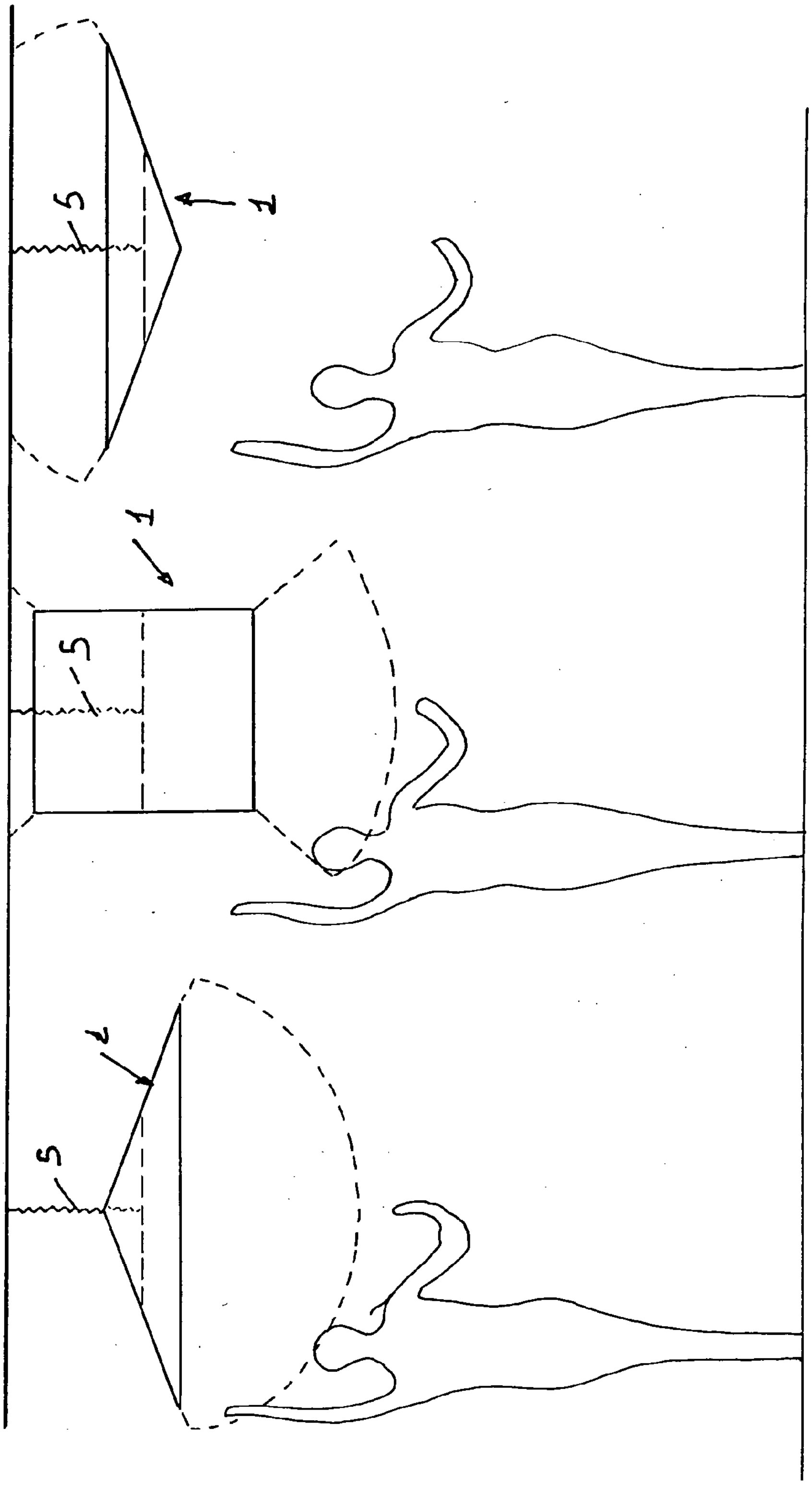

FIG. 13

FIG. 14

FIG. 15

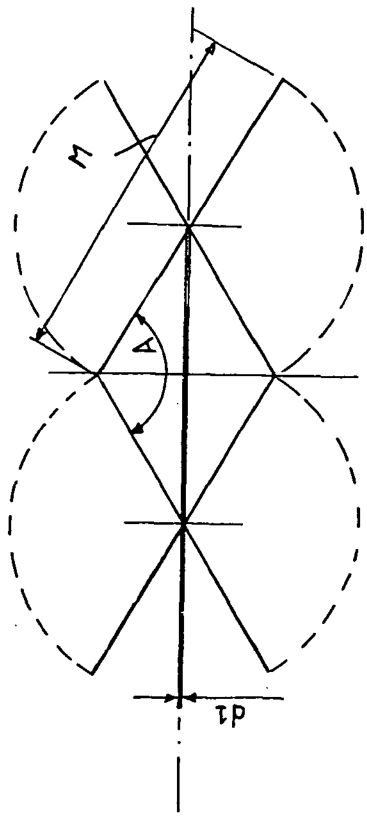

FiG. 17

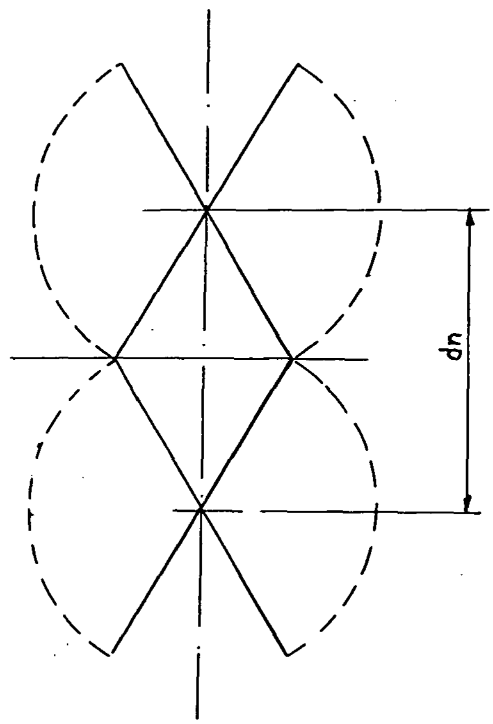

FiG. 16

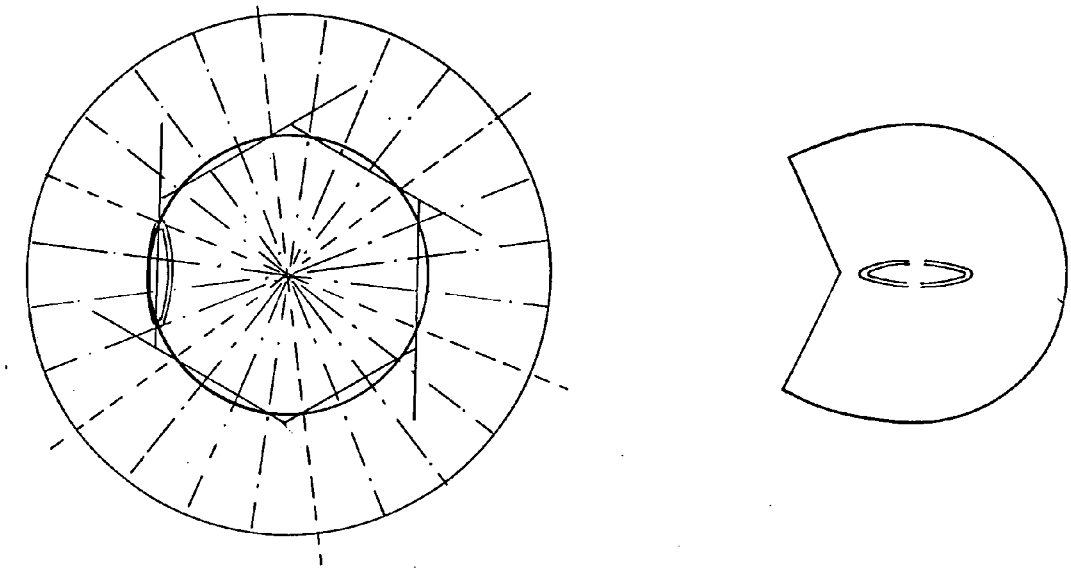

FIG. 18

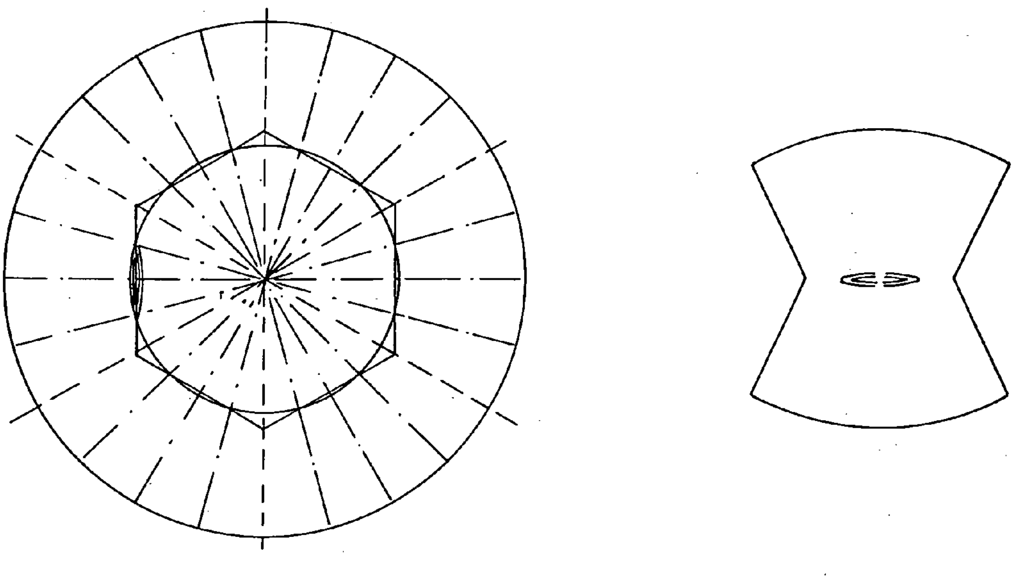

FIG. 19

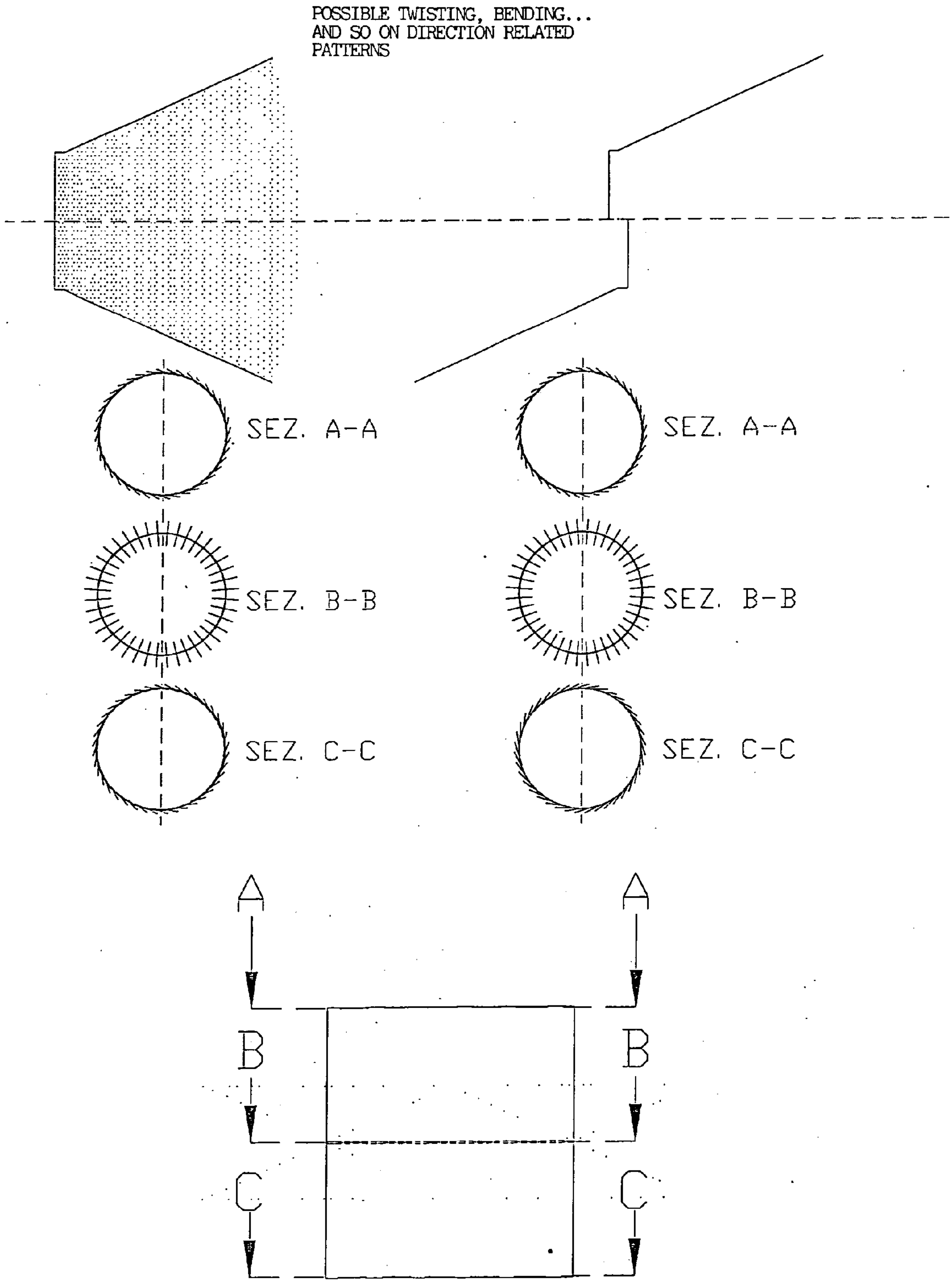
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Fig. 20

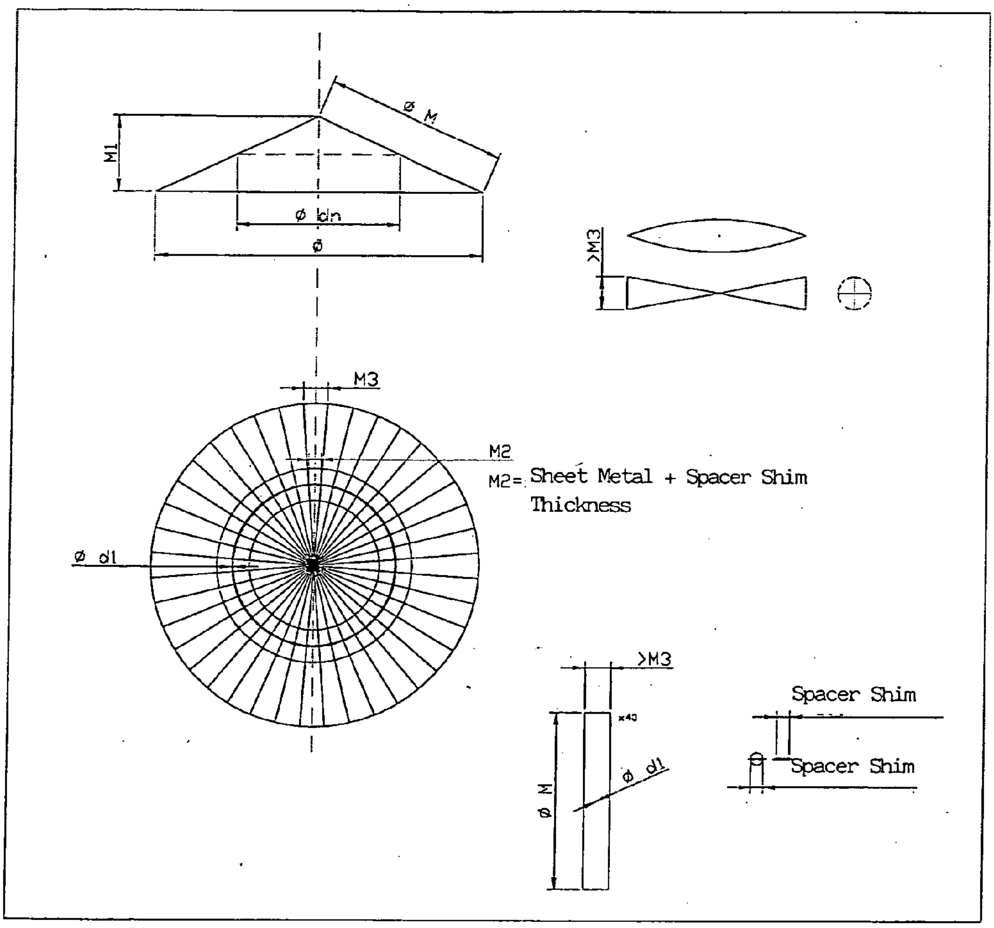
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Fig. 21

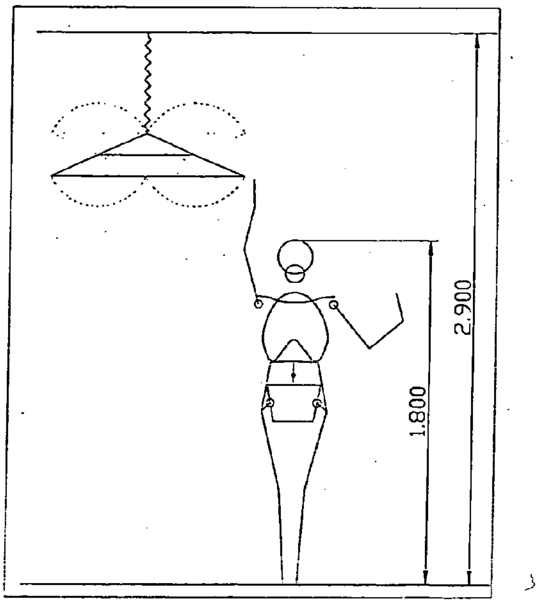
2.900
1.800

Fig. 22

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 00 5383

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 20 2004 011140 U1 (ANSORG BELUX GMBH [DE]) 16 September 2004 (2004-09-16) * paragraph [0014] * * figures 1a)-1c) * -----	1-3,5, 12,13, 15-21	INV. F21V7/16 F21V1/08
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F21V

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 June 2007	Allen, Katie

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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P : intermediate document

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L : document cited for other reasons
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2

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 00 5383

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82