

Description

Background of the Invention

The present invention relates to a light conduction apparatus which promotes effective distribution of light for the photosynthesis of various photosynthetic substances such as algae typified by chlorella or spiroulina, photosynthetic bacteria, artificial photosynthetic substances such as callus, plants and mushroom.

Installations heretofore proposed for photosynthesis include those for culturing chlorella. As well known to the art, chlorella is cultured by photosynthetic reactions under the supply of light and carbon dioxide (CO₂) and it has been customary to continuously supply light to chlorella throughout a reaction process. However, detailed analysis of the photosynthesis of chlorella showed that one reaction cycle requires the supply of light only for a fragment of its period (about 10 μ sec) and proceeds without light for the rest of the period (about 200 μ sec); the supply of light is rather undesirable for an effective reaction except for the fragmental period.

Meanwhile, a light source for culturing chlorella has usually been constituted by a number of fluorescent lamps arranged in a reaction or culture bath. A culture medium is caused to flow through the gaps between the adjacent fluorescent lamps in the bath. This suffers from the drawbacks that the whole apparatus becomes bulky, that the power consumption is objectionable, and that a troublesome countermeasure is required against heat generation. To eliminate these drawbacks, I have proposed in various forms (US-PS-4420796) to arrange photoradiators at the ends of optical fibers and converge the sunlight or any desired artificial light into the optical fibers, for thereby utilizing the light radiated from the photoradiators as a light source for photosynthesis. Still, the installations with such photoradiators cannot be made larger in dimension without needing a larger number of photoradiators and, therefore, a larger amount of converged light. This in turn requires a larger device for converging the sunlight or artificial light into the optical fibers.

Summary of the Invention

A light conduction apparatus for photosynthetic reaction embodying the present invention includes a first light conducting member for conducting light therethrough. The light is input to one end of the light conducting member and output at the other end. A plurality of circularly arranged second light conducting members conduct light therethrough which is input at one ends thereof to a confinement in which photosynthetic reactions are to occur. Rotatable light distributor means routes the light output from the other end of the first light conducting member to the second light conducting members along at least one optical path defined therein and distributes the light to each of the second light conducting members once for one full rotation thereof.

In accordance with the present invention, a light conduction apparatus for photosynthetic reaction includes a rotatable light distributor which may be a transparent rod or disc. Converged light is guided by a solid or tubular light conducting member into the light distributor and routed along at least one optical path through the light distributor as far as a radiation surface of the latter. The light output from the radiation surface is supplied a moment to each of a number of light conducting rods, which lead to a confinement for photosynthesis, once for one full rotation of the light distributor. Thus, the confinement shares a single light source which can be small size for given dimensions of the confinement.

It is an object of the present invention to provide a light conduction apparatus which causes photosynthetic reactions to occur effectively by intermittent supply of light to a reactant.

It is another object of the present invention to provide a light conduction apparatus which allows a predetermined capacity of light converging device to suffice for the illumination of larger scale installations for photosynthesis.

It is another object of the present invention to provide a generally improved light conduction apparatus for photosynthetic reaction.

Other objects, together with the foregoing, are attained in the embodiments described in the following description and illustrated in the accompanying drawings.

Brief Description of the Drawings

Fig. 1 is a sectional view of a light conduction apparatus embodying the present invention;

Fig. 2 is a section along line II-II of Fig. 1;

Fig. 3 is a fragmentary sectional side elevation of another embodiment of the present invention;

Fig. 4a is a fragmentary plan view of another embodiment of the present invention;

Fig. 4b is a sectional side elevation of a light distributor shown in Fig. 4a;

Figs. 5a-5c are views of various modifications to the construction shown in Figs. 4a and 4b;

Fig. 6 is a fragmentary side elevation of another embodiment of the present invention; and

Figs. 7a and 7b are enlarged plan views of different configurations of a light radiation surface.

Description of the Preferred Embodiments

While the light conduction apparatus for photosynthetic reaction of the present invention is susceptible of numerous physical embodiments, depending upon the environment and requirements of use, substantial numbers of the herein shown and described embodiments have been made, tested and used, and all have performed in an eminently satisfactory manner.

Referring to Fig. 1 of the drawings, a light conduction apparatus of the present invention comprises a frame or housing 10 which is fixed in place by suitable support means. A transparent light distributor 12 in the form of a rod is rotatably disposed in the frame 10 and held in driven con-

nection with a motor 14, which is mounted on the bottom of the frame 10. The axis of rotation of the light distributor 12 is indicated by a phantom line Q. A solid or tubular light conducting member 16 extends into the frame 10 and has an axis which is aligned with the axis Q at its end 16a adjacent to the light distributor 12. The light conductor 16 is adapted to transmit therethrough light which has been converged therinto by a converging lens (not shown). The light applicable to the present invention may be the sunlight or any desired artificial light.

A mirror 18 is disposed in the light distributor 12 in alignment with the axis Q so as to steer the light output from the end 16a of the light conductor 16 toward an end portion 12a of the light distributor 12. A second mirror 20 is mounted in the end portion 12a of the light distributor 12, so that the light reflected by the mirror 18 will become incident on the mirror 20. The mirror 20 reflects the incident light toward the outside of the light distributor 12 through a radiation surface 12b.

A number of light conducting members or rods 22 are fixedly arranged around the axis Q of rotation of the light distributor 12. As best shown in Fig. 2, the rods 22 are arranged such that the radiation surface 12b of the light distributor 12 successively moves past their upper or light input ends while in rotation about the axis Q. Each rod 22 extends from the frame 10 to a photoradiator 24 which is located in a reaction bath 26 for photosynthesis at a predetermined spacing from neighboring ones. It will be apparent that the reaction bath 26 is only illustrative and may be replaced by any other confinement such as an indoor plant growing garden. I have proposed photoradiators 24 in various forms as disclosed in Japanese Patent Publication No. 58-10702, for example, and details thereof will not be described for the sake of simplicity.

In operation, the sunlight or desired artificial light propagated through the light conductor 16 is constantly reflected by the mirror 18 and then by the mirror 20 to come out the light distributor 12 through the radiation surface 12b. As the motor 14 is energized to rotate the light distributor 12 about the axis Q, the radiation surface 12b successively moves past the upper ends of the rods 22 which are arranged circularly around the axis Q. Each rod 22, therefore, is illuminated a moment once for one full rotation of the light distributor 12. The illumination time for each rod 22 may be about 10 μ sec, for example. A photosynthetic substance in the bath 26 starts a photosynthetic reaction cycle around each rod 22 in response to the momentary supply of the light from the radiation surface 12a. The reaction cycle around the rod 22 proceeds while the light distributor 12 is rotating to distribute the light to the other rods 22. When the radiation surface 12a returns to the rod 22 concerned completing one full rotation, a second photosynthetic cycle begins in response to the resultant supply of the light. In this manner, photosynthesis continues effectively over the entire area of the reaction bath 26.

Thus, in accordance with the construction and arrangement shown in Figs. 1 and 2, the light intensity above a lower limit necessary for photosynthesis can be insured merely by intensifying the light which reaches such a small area defined by the radiation surface 12b of the light distributor 12. This promotes a compact design of the device which is adapted to converge the natural or artificial light into the light conductor 16. Also, the sequential supply of the light to the number of light conducting rods 22 can cover a reaction bath having substantial dimensions.

Referring to Fig. 3, another embodiment of the present invention is shown which will desirably function when the intensity of the light transmitted through the light conductor 16 is substantially high. In contrast to the single optical path in Figs. 1 and 2 which leads from the mirror 18 to only one end of the light distributor 12, two optical paths extend away from each other to opposite ends of the light distributor 12 in the case of this alternative embodiment. As shown, two mirrors 30 are disposed in the light distributor 12 with their reflection surfaces oriented opposite to each other with respect to the axis Q of the light distributor 12. In this situation, the light output from the end 16a of the light conductor 16 will be reflected by the mirrors 30 to be routed along the two opposite paths toward opposite ends of the light distributor 12. It will be apparent in this case that the light distributor 12 is provided with the radiation surface 12b and mirror 20 at each end thereof. The double mirror arrangement is advantageous over the single mirror arrangement because it halves the required rotation speed of the distributor 12.

While the light distributor has been shown and described as taking the form of a rod, the rod may be replaced by a transparent disc as will be described with reference to Figs. 4a and 4b. As shown, a light distributor 40 in the form of a transparent disc has a pyramid 42 at its axis Q whose reflection surface is oriented to reflect the incident light as indicated by arrows in Fig. 4b. Then, the light will be radiated at one location of the peripheral portion of the light distributor 40.

The configuration of the pyramid shown in Figs. 4a and 4b is not limitative but may be replaced with any other desired pyramidal form. For example, a pyramid 42' shown in Fig. 5a has two reflection surfaces to steer the input light from the light conductor 16 to diametrically opposite peripheral portions of the light distributor 40. A pyramid 42'' shown in Fig. 5b has three reflection surfaces (triangular pyramid) which cause the input light to be redirected to three different peripheral portions of the light distributor 40. Further, a pyramid 42''' shown in Fig. 5c has four reflection surfaces (quadrangular pyramid) so that the input light is routed along four crosswise optical paths through the light distributor 40. Naturally, such different configurations of pyramids, inclusive of the pyramid shown in Figs. 4a and 4b, may be selectively used on a single disc 40 in order to vary the amount and/or the frequency of illumination for each rod 22.

As shown in Fig. 6, a pyramidal photocoupler 60 may be fixed to the radiation surface 12a of the light distributor 12 or 40. The photocoupler 60 will serve to more effectively guide the light output from the radiation surface 12a into the light conducting rods 22. In this case, a radiation surface 12b' is defined by the end of the photocoupler which faces the rods 22.

The radiation surface 12b of the light distributor or that 12b' of the photocoupler 60 has a sectorial shape which covers one row of radially aligned rods 22 at a time as indicated by a hatched area A in Fig. 7a, or a plurality of rows of radially aligned rods 22 at a time as indicated by a hatched area B in Fig. 7b. The radially innermost end I and outermost end I' of the sector A or B are formed arcuate to respectively coincide with the radially innermost and outermost ends of the annulus L which is defined by the rods 22. Thus, the light output from the radiation surface 12b or 12b' is allowed to become evenly incident on all the rods 22 which are simultaneously covered by the sector A or B.

In summary, it will be seen that the present invention provides a light conduction apparatus which promotes effective photosynthetic reactions and accommodates a larger reaction area for a given scale of a light source.

Various modifications will become possible for those skilled in the art after receiving the teachings of the present disclosure without departing from the scope thereof. For example, part of the photoradiators 24 constituted by the ends of the rods 22 may lead to one reaction bath and the rest to another reaction bath, instead of the single reaction bath shown and described.

Claims

1. A light conduction apparatus for photosynthetic reaction, comprising:

a first light conducting member (16) for conducting light therethrough, the light being input at one end of said light conducting member and output at the other end (16a);

a plurality of circularly arranged second light conduction members (22) for conducting therethrough light input at one end thereof to a confinement in which photosynthetic reactions are to occur; and

rotatable light distributor means (12, 40) for routing the light output from said other end (16a) of the first light conducting member (16) to the second light conducting members (22) along at least one optical path (18, 20) defined therein and distributing the light to each of the second light conducting members (22) once for one full rotation thereof.

2. A light conduction apparatus as claimed in claim 1, in which the light distributor means comprises a transparent rod (12) having a radiation surface (12b) formed at least one end portion thereof, the first light conductor (16) facing the axis of rotation (Q) of said rod at said other end (16a) thereof, said radiation surface (12b) being

positioned to sequentially move past said one end of the second light conductors (22) while the rod (12) is in rotation.

3. A light conduction apparatus as claimed in claim 2, in which the optical path extends from the axis of rotation (Q) of the rod (12) to the radiation surface (12b).

4. A light conduction apparatus as claimed in claim 3, in which the optical path is defined by a mirror (18), which is positioned in the rod (12) to face said other end of first light conductor (16) at the reflection surface thereof.

5. A light conduction apparatus as claimed in claim 2, in which two said optical paths (30) extend from the axis of rotation of the rod (12) away from each other to the radiation surfaces formed at opposite end portions of the rod, respectively.

6. A light conduction apparatus as claimed in claim 5, in which the optical paths are respectively defined by mirrors (18) which are positioned in the rod (12) to individually face said other end (16a) of the first light conductor (16) at the reflection surfaces thereof.

7. A light conduction apparatus as claimed in claim 2, in which the radiation surface (12b) has a sectorial shape and the second light conducting members (22) are arranged along a plurality of concentric circles (L).

8. A light conduction apparatus as claimed in claim 7, in which the radiation surface (12b) covers a single row of radially aligned said second light conductors at a time.

9. A light conduction apparatus as claimed in claim 7, in which the radiation surface (12b) covers a plurality of rows of radially aligned second light conductors (22) at a time.

10. A light conduction apparatus as claimed in claim 1, in which the light distributor means comprises a transparent disc (40) having a radiation surface formed at least one radially outermost portion thereof, the first light conductor (16) facing the axis of rotation (Q) of said disc at said other end (16a) thereof, said radiation surface being positioned to sequentially move past said one ends of the second light conductors (22) while the disc is in rotation.

11. A light conduction apparatus as claimed in claim 10, in which the optical path extends from the axis of rotation of the disc (40) to the radiation surface.

12. A light conduction apparatus as claimed in claim 10, in which a plurality of said optical paths extend from the axis of rotation of the disc (40) to the radiation surfaces formed at radially outermost portions of the disc (40), respectively.

13. A light conduction apparatus as claimed in claim 10, in which the radiation surface has a sectorial shape (A, B) and the second light conductors (22) are arranged along a plurality of concentric circles (L).

14. A light conduction apparatus as claimed in claim 13, in which the sector (A) covers a single row or radially aligned second light conductors (22) at a time.

As shown in Fig. 6, a pyramidal photocoupler 60 may be fixed to the radiation surface 12a of the light distributor 12 or 40. The photocoupler 60 will serve to more effectively guide the light output from the radiation surface 12a into the light conducting rods 22. In this case, a radiation surface 12b' is defined by the end of the photocoupler which faces the rods 22.

The radiation surface 12b of the light distributor or that 12b' of the photocoupler 60 has a sectorial shape which covers one row of radially aligned rods 22 at a time as indicated by a hatched area A in Fig. 7a, or a plurality of rows of radially aligned rods 22 at a time as indicated by a hatched area B in Fig. 7b. The radially innermost end I and outermost end I' of the sector A or B are formed arcuate to respectively coincide with the radially innermost and outermost ends of the annulus L which is defined by the rods 22. Thus, the light output from the radiation surface 12b or 12b' is allowed to become evenly incident on all the rods 22 which are simultaneously covered by the sector A or B.

In summary, it will be seen that the present invention provides a light conduction apparatus which promotes effective photosynthetic reactions and accommodates a larger reaction area for a given scale of a light source.

Various modifications will become possible for those skilled in the art after receiving the teachings of the present disclosure without departing from the scope thereof. For example, part of the photoradiators 24 constituted by the ends of the rods 22 may lead to one reaction bath and the rest to another reaction bath, instead of the single reaction bath shown and described.

Claims

1. A light conduction apparatus for photosynthetic reaction, comprising:

a first light conducting member (16) for conducting light therethrough, the light being input at one end of said light conducting member and output at the other end (16a);

a plurality of circularly arranged second light conducting members (22) for conducting therethrough light input at one end thereof to a confinement in which photosynthetic reactions are to occur; and

rotatable light distributor means (12, 40) for routing the light output from said other end (16a) of the first light conducting member (16) to the second light conducting members (22) along at least one optical path (18, 20) defined therein and distributing the light to each of the second light conducting members (22) once for one full rotation thereof.

2. A light conduction apparatus as claimed in claim 1, in which the light distributor means comprises a transparent rod (12) having a radiation surface (12b) formed at least one end portion thereof, the first light conductor (16) facing the axis of rotation (Q) of said rod at said other end (16a) thereof, said radiation surface (12b) being

positioned to sequentially move past said one end of the second light conductors (22) while the rod (12) is in rotation.

3. A light conduction apparatus as claimed in claim 2, in which the optical path extends from the axis of rotation (Q) of the rod (12) to the radiation surface (12b).

4. A light conduction apparatus as claimed in claim 3, in which the optical path is defined by a mirror (18), which is positioned in the rod (12) to face said other end of first light conductor (16) at the reflection surface thereof.

5. A light conduction apparatus as claimed in claim 2, in which two said optical paths (30) extend from the axis of rotation of the rod (12) away from each other to the radiation surfaces formed at opposite end portions of the rod, respectively.

6. A light conduction apparatus as claimed in claim 5, in which the optical paths are respectively defined by mirrors (18) which are positioned in the rod (12) to individually face said other end (16a) of the first light conductor (16) at the reflection surfaces thereof.

7. A light conduction apparatus as claimed in claim 2, in which the radiation surface (12b) has a sectorial shape and the second light conducting members (22) are arranged along a plurality of concentric circles (L).

8. A light conduction apparatus as claimed in claim 7, in which the radiation surface (12b) covers a single row of radially aligned said second light conductors at a time.

9. A light conduction apparatus as claimed in claim 7, in which the radiation surface (12b) covers a plurality of rows of radially aligned second light conductors (22) at a time.

10. A light conduction apparatus as claimed in claim 1, in which the light distributor means comprises a transparent disc (40) having a radiation surface formed at least one radially outermost portion thereof, the first light conductor (16) facing the axis of rotation (Q) of said disc at said other end (16a) thereof, said radiation surface being positioned to sequentially move past said one ends of the second light conductors (22) while the disc is in rotation.

11. A light conduction apparatus as claimed in claim 10, in which the optical path extends from the axis of rotation of the disc (40) to the radiation surface.

12. A light conduction apparatus as claimed in claim 10, in which a plurality of said optical paths extend from the axis of rotation of the disc (40) to the radiation surfaces formed at radially outermost portions of the disc (40), respectively.

13. A light conduction apparatus as claimed in claim 10, in which the radiation surface has a sectorial shape (A, B) and the second light conductors (22) are arranged along a plurality of concentric circles (L).

14. A light conduction apparatus as claimed in claim 13, in which the sector (A) covers a single row or radially aligned second light conductors (22) at a time.



15. A light conduction apparatus as claimed in claim 13, in which the sector (B) covers a plurality of rows of radially aligned said second light conductors (22) at a time.

16. A light conduction apparatus as claimed in claim 10, in which the optical path is defined by a pyramid (42, 42', 42'', 42''') located in the disc to face said other end of the first light conductor (16).

17. A light conduction apparatus as claimed in claim 16, in which the pyramid is replaceable with another pyramid.

18. A light conduction apparatus as claimed in claim 1, in which the light input to the first light conductor (16) is the sunlight.

19. A light conduction apparatus as claimed in claim 1, in which the light input to the first light conductor (16) is artificial light.

Patentansprüche

1. Lichtleitgerät für eine photosynthetische Reaktion, welches umfaßt:

einen ersten Lichtleiter (16) durch den Licht geleitet wird, welches an einem Ende des Lichtleiters ein und am anderen Ende (16a) wieder austritt;

mehrere kreisförmig angeordnete zweite Lichtleiter (22), die Licht, welches auf der Lichteintrittsseite eintritt, an einen Behälter weiterleiten, in dem Photosynthesereaktionen stattfinden sollen;

und einen drehbaren Lichtverteiler (12, 40), der das auf dem anderen Ende (16a) des ersten Lichtleiters (16) austretende Licht zu dem zweiten Lichtleiter (22) über wenigstens einen optischen Weg (18, 20) weiterleitet, wobei dieser optische Weg innerhalb des Lichtverters liegt und wobei jeder zweite Lichtleiter (22) bei jeder Umdrehung der Verteilers einmal Licht erhält.

2. Lichtleitgerät nach Anspruch 1, wobei der Lichtverteiler einen durchlässigen Stab (12) aufweist, der an wenigstens einem Ende eine Strahlungsfläche (12b) aufweist, und wobei der erste Lichtleiter (16) in der Drehachse (Q) des Stabes auf dessen anderes Ende (16a) gerichtet ist, und wobei die Strahlungsfläche (12b) so angeordnet ist, daß sie sich nach und nach über die einen Enden der jeweiligen zweiten Lichtleiter (22) bewegt, während der Stab sich dreht.

3. Lichtleitgerät nach Anspruch 2, wobei der optische Weg sich von der Drehachse (Q) des Stabes (12) zur Strahlungsfläche (12b) erstreckt.

4. Lichtleitgerät nach Anspruch 3, wobei der optische Weg von einem Spiegel (18) festgelegt ist, der in dem Stab (12) so angeordnet ist, daß er mit seiner reflektierenden Oberfläche auf das andere Ende des ersten Lichtleiters (16) weist.

5. Lichtleitgerät nach Anspruch 2, wobei zwei optische Wege (30) sich von der Drehachse des Stabes (12) weg voneinander zur Strahlungsfläche erstrecken, die an gegenüberliegenden Enden des Stabes jeweils angeordnet sind.

6. Lichtleitgerät nach Anspruch 5, wobei die optischen Wege von Spiegeln (18) festgelegt werden, die in dem Stab (12) so angeordnet sind,

daß sie auf die anderen Enden (16a) des ersten Lichtleiters (16) mit ihren reflektierenden Oberflächen weisen.

7. Lichtleitgerät nach Anspruch 2, wobei die Strahlungsfläche (12b) Sektorform hat und wobei die zweiten Lichtleiter (22) in mehreren konzentrischen Kreisen (L) zueinander angeordnet sind.

8. Lichtleitgerät nach Anspruch 7, wobei die Strahlungsfläche (12b) eine einzelne Reihe von radial zueinander ausgerichteten zweiten Lichtleitern gleichzeitig überdeckt.

9. Lichtleitgerät nach Anspruch 7, wobei die Strahlungsfläche (12b) mehrere Reihen radial zueinander ausgerichteter zweiter Lichtleiter (22) gleichzeitig überdeckt.

10. Lichtleitgerät nach Anspruch 1, wobei der Lichtverteiler eine durchlässige Scheibe (40) mit einer Strahlungsfläche aufweist, die an wenigstens einem radial äußersten Bereich der Scheibe ausgebildet ist, und daß der erste Lichtleiter (16) mit seinem anderen Ende (16a) auf die Drehachse (Q) der Scheibe gerichtet ist, wobei die Strahlungsfläche so angeordnet ist, daß sie nacheinanderfolgend über die einen Enden der zweiten Lichtleiter (20) sich bewegt, während die Scheibe sich dreht.

11. Lichtleitgerät nach Anspruch 10, wobei sich der optische Weg von der Drehachse der Scheibe (40) zu der Strahlungsfläche erstreckt.

12. Lichtleitgerät nach Anspruch 10, wobei mehrere optische Wege sich von der Drehachse der Scheibe (40) zu Strahlungsflächen erstrecken, die jeweils an radial äußeren Teilen der Scheibe (40) vorhanden sind.

13. Lichtleitgerät nach Anspruch 10, wobei die Strahlungsfläche eine Sektorform (A, B) hat, und wobei die zweiten Lichtleiter (22) in mehreren konzentrischen Kreisen (L) zueinander angeordnet sind.

14. Lichtleitgerät nach Anspruch 13, wobei der Sektor (A) eine einzelne Reihe radial zueinander ausgerichteter zweiter Lichtleiter (22) gleichzeitig überdeckt.

15. Lichtleitgerät nach Anspruch 13, wobei der Sektor (B) mehrere Reihen von radial zueinander ausgerichteten zweiten Lichtleitern (22) gleichzeitig überdeckt.

16. Lichtleitgerät nach Anspruch 10, wobei der optische Weg durch eine Pyramide (42, 42', 42'', 42''') festgelegt wird, die in der Scheibe so angeordnet ist, daß sie auf das andere Ende des ersten Lichtleiters (16) gerichtet ist.

17. Lichtleitgerät nach Anspruch 16, wobei die Pyramide durch eine andere Pyramide ersetzbar ist.

18. Lichtleitgerät nach Anspruch 1, wobei das Licht, welches in den ersten Lichtleiter (16) eintritt, Sonnenlicht ist.

19. Lichtleitgerät nach Anspruch 1, wobei das Licht, welches in den ersten Lichtleiter (16) eintritt, künstliches Licht ist.



Revendications

1. Un appareil de conduction de lumière pour réaction photosynthétique, comprenant:

— un premier élément conducteur de lumière (16) pour conduire de la lumière en son intérieur, la lumière étant introduite à une extrémité dudit élément conducteur de lumière et sortant à l'autre extrémité (16a);

— une pluralité de seconds éléments conducteurs de lumière (22) disposés circulairement pour conduire en leur intérieur de la lumière entrant par une de leurs extrémités jusque dans un espace dans lequel doivent se produire des réactions de photosynthèse; et

— un moyen rotatif de distribution de lumière (12, 40) pour transmettre la lumière sortant par ladite autre extrémité (16a) du premier élément conducteur de lumière (16) vers les seconds éléments conducteurs de lumière (22) le long d'au moins un trajet optique (18, 20) définis intérieurement et pour distribuer la lumière à chacun des seconds éléments conducteurs de lumière (22) une fois à chaque révolution complète.

2. Un appareil de conduction de lumière tel que revendiqué dans la revendication 1, dans lequel le moyen distributeur de lumière comprend une tige transparente (12) comportant une surface de rayonnement (12b) formée au moins sur une de ses parties extrêmes, le premier conducteur de lumière (16) étant dirigé vers l'axe de rotation (Q) de ladite tige à son autre extrémité (16a), ladite surface de rayonnement (12b) étant positionnée de façon à se déplacer séquentiellement devant ladite première extrémité des seconds conducteurs de lumière (22) pendant la rotation de la tige (12).

3. Un appareil de conduction de lumière tel que revendiqué dans la revendication 2, dans lequel le trajet optique s'étend depuis l'axe de rotation (Q) de la tige (12) jusqu'à la surface de rayonnement (12b).

4. Un appareil de conduction de lumière tel que revendiqué dans la revendication 3, dans lequel le trajet optique est défini par un miroir (18), qui est positionné dans la tige (12) de façon à être dirigé vers ladite autre extrémité du premier conducteur de lumière (16) sur sa surface réfléchissante.

5. Un appareil de conduction de lumière tel que revendiqué dans la revendication 2, dans lequel deux trajets optiques (30) s'étendent depuis l'axe de rotation de la tige (12) dans des directions mutuellement opposées vers les surfaces de rayonnement qui sont formées sur des parties extrêmes opposées respectives de la tige.

6. Un appareil de conduction de lumière tel que revendiqué dans la revendication 5, dans lequel les trajets optiques sont respectivement définis par des miroirs (18) qui sont positionnés dans la tige (12) de façon à être dirigés individuellement vers ladite autre extrémité (16a) du premier conducteur de lumière (16) sur ses surfaces réfléchissantes.

7. Un appareil de conduction de lumière tel que revendiqué dans la revendication 2, dans lequel la

surface de rayonnement (12b) a une forme de secteur et les seconds éléments conducteurs de lumière (22) sont disposés le long d'une pluralité de cercles concentriques (L).

8. Un appareil de conduction de lumière tel que revendiqué dans la revendication 7, dans lequel la surface de rayonnement (12b) couvre une seule rangée desdits seconds éléments conducteurs qui sont alignés radialement à un moment donné.

9. Un appareil de conduction de lumière tel que revendiqué dans la revendication 7, dans lequel la surface de rayonnement (12b) couvre une pluralité de rangées de seconds éléments conducteurs de lumière alignés radialement (22) à un moment donné.

10. Un appareil de conduction de lumière tel que revendiqué dans la revendication 1, dans lequel le moyen distributeur de lumière comprend un disque transparent (40) comportant une surface de rayonnement qui est formée au moins sur une de ses parties extrêmes situées radialement le plus à l'extérieur, le premier conducteur de lumière (16) étant dirigé radialement vers l'axe de rotation (Q) dudit disque à son autre extrémité (16a), ladite surface de rayonnement étant positionnée de façon à se déplacer séquentiellement devant lesdites premières extrémités des seconds conducteurs de lumière (22) pendant que le disque tourne.

11. Un appareil de conduction de lumière tel que revendiqué dans la revendication 10, dans lequel le trajet optique s'étend depuis l'axe de rotation du disque (40) jusqu'à la surface de rayonnement.

12. Un appareil de conduction de lumière tel que revendiqué dans la revendication 10, dans lequel une pluralité desdits trajets optiques s'étendent depuis l'axe de rotation du disque (40) jusqu'aux surfaces de rayonnement qui sont formées sur des parties du disque (40) qui sont respectivement placées radialement le plus à l'extérieur.

13. Un appareil de conduction de lumière tel que revendiqué dans la revendication 10, dans lequel la surface de rayonnement a une forme de secteur (A, B) et les seconds conducteurs de lumière (22) sont disposés le long d'une pluralité de cercles concentriques (L).

14. Un appareil de conduction de lumière tel que revendiqué dans la revendication 13, dans lequel le secteur (A) couvre une seule rangée de seconds conducteurs de lumière alignés radialement (22) à un moment donné.

15. Un appareil de conduction de lumière tel que revendiqué dans la revendication 13, dans lequel le secteur (B) couvre une pluralité de rangées de seconds conducteurs de lumière alignés radialement (22) à un moment donné.

16. Un appareil de conduction de lumière tel que revendiqué dans la revendication 10, dans lequel le trajet optique est défini par une pyramide (42, 42', 42'', 42''') placée dans le disque de façon à être dirigée vers ladite autre extrémité du premier conducteur de lumière (16).

17. Un appareil de conduction de lumière tel que revendiqué dans la revendication 16, dans lequel la pyramide est remplaçable par une autre pyramide.



18. Un appareil de conduction de lumière tel que revendiqué dans la revendication 1, dans lequel la lumière entrant dans le premier conducteur de lumière (16) est la lumière solaire.

19. Un appareil de conduction de lumière tel que revendiqué dans la revendication 1, dans lequel la lumière entrant dans le premier conducteur de lumière (16) est une lumière artificielle.

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