

[54] **LIGHT FIXTURE HAVING GIMBALLED
OPEN RING CARRYING FOCUSED LIGHT
PIPE OUTLETS**

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Primary Examiner—Richard L. Moses

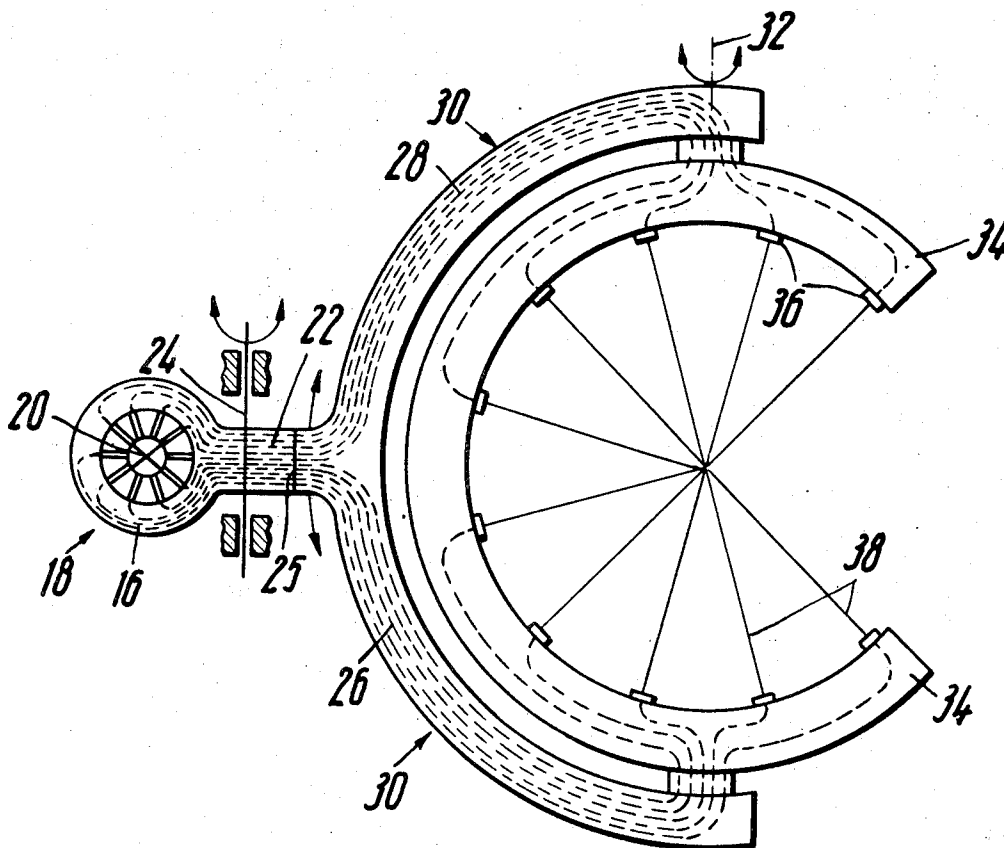
Attorney—Richard C. Sughrue et al.

[57]

ABSTRACT

A light fixture for a hospital operating room comprises an open circle light outlet ring gimballed within a pivotable yoke. One or more light sources are provided which feed a plurality of light pipe whose outlets are disposed around the inner periphery of the ring. The outlet ends of the light pipes are inclined with respect to the horizontal plane to focus the light toward the center of the area beneath the ring. The light sources may be disposed behind the yoke pivot to provide a counterweight, or within the ring in order to shorten the length of the light pipes.

6 Claims, 7 Drawing Figures



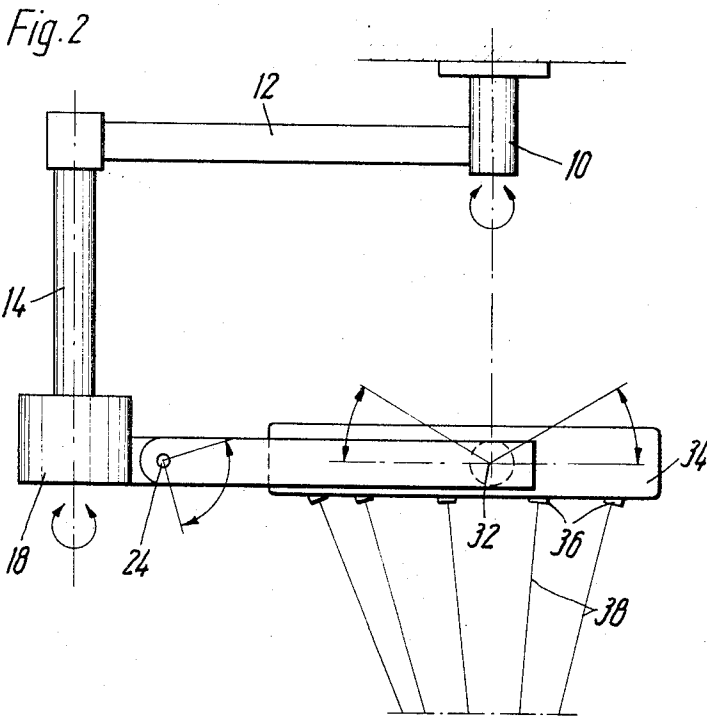
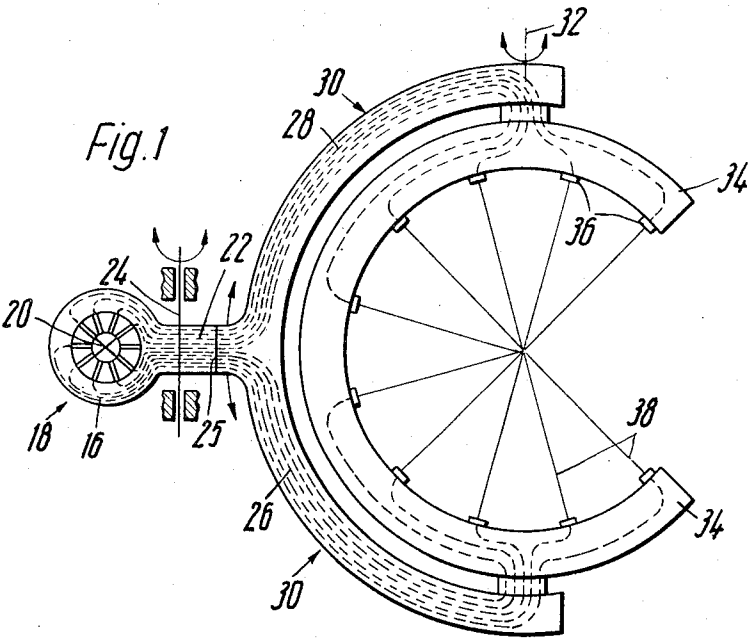
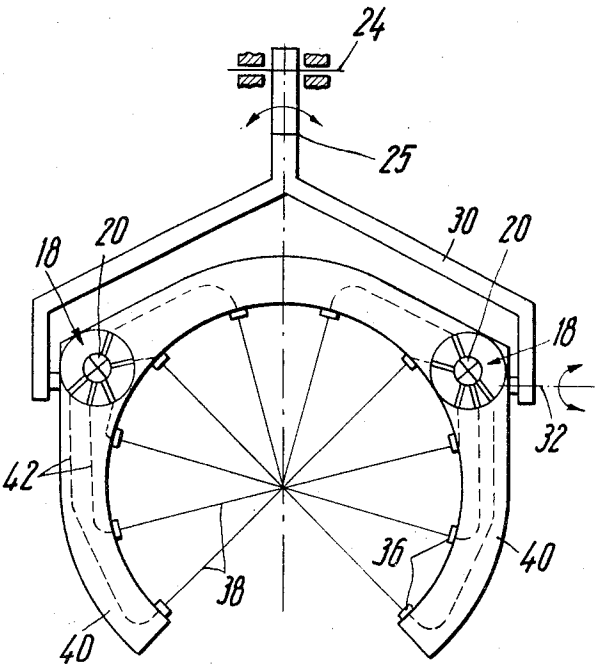
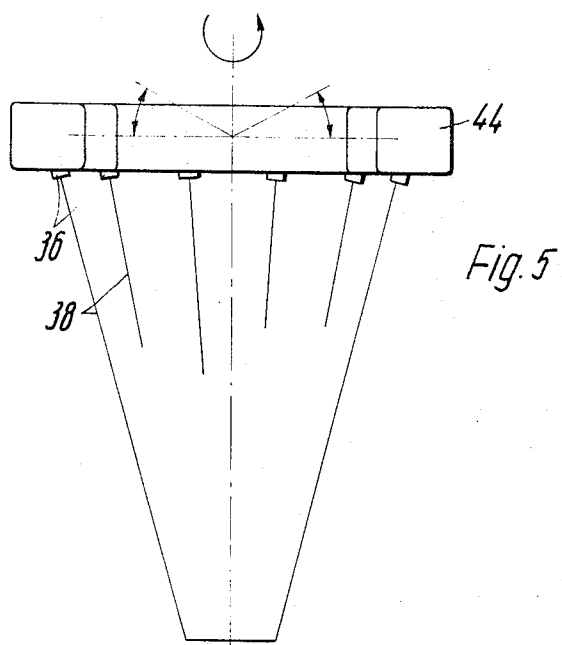
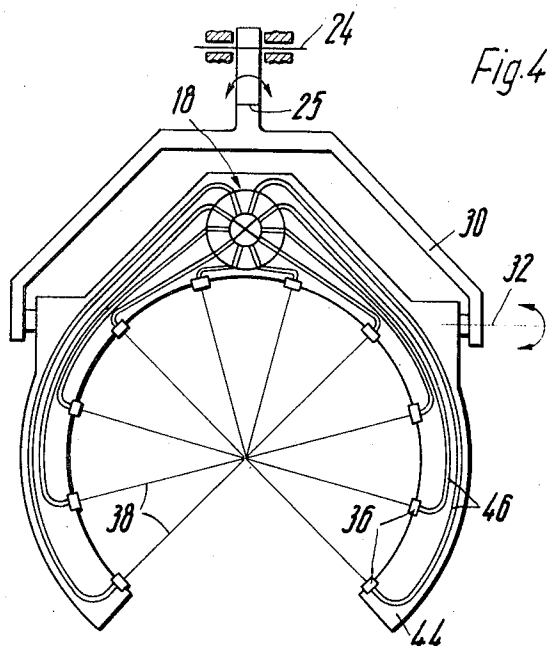
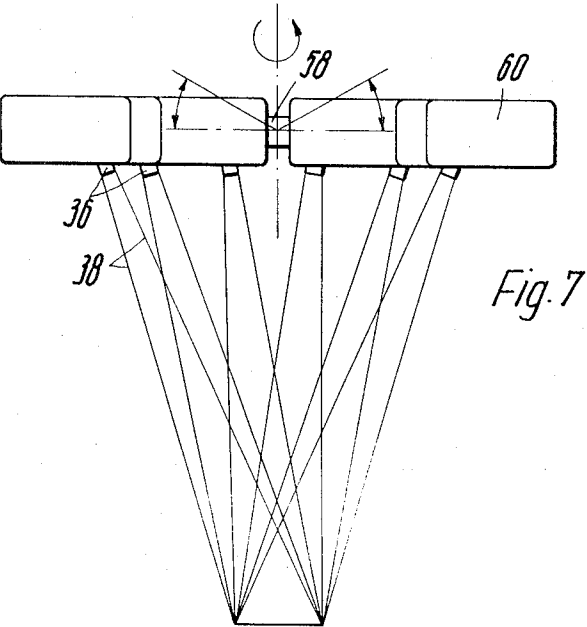
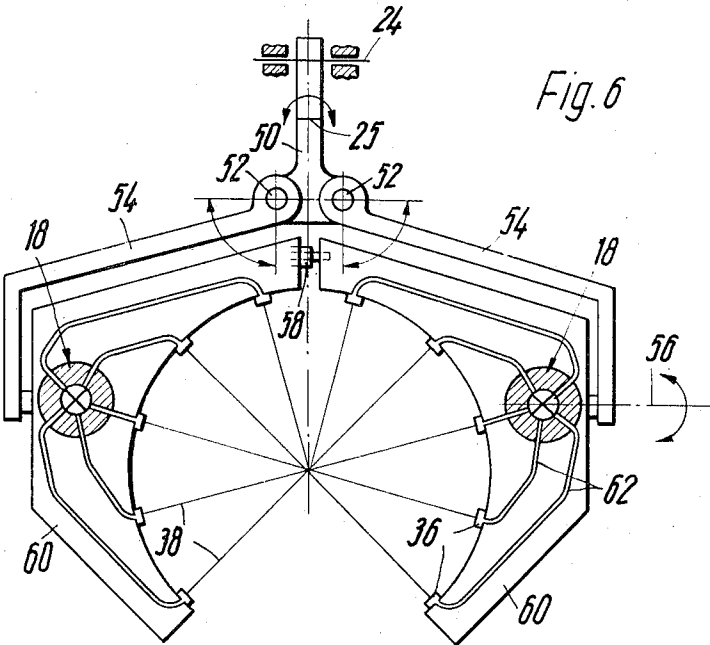


Fig. 3







LIGHT FIXTURE HAVING GIMBALED OPEN RING CARRYING FOCUSED LIGHT PIPE OUTLETS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an operating lamp having a movable lighting unit suspended above the operating area, said lighting unit having a plurality of light outlets which are connected to at least one light source via flexible light lines.

2. Description of the Prior Art

Light rods and flexible light lines for the focussed transmission of light, in which the light is transmitted by total reflection of avoid light loss, are known in the fields of electrotechnology and medicine.

In the case of a known multi-eye operating lamp having flexible light lines, the ends of these lines terminate in a closed lighting unit having an extensive surface area. The light outlets which replace the bulbs which would otherwise be present, are disposed in the lighting unit. A single common light source is provided for all the light outlets. This is located in a separate housing from the lighting unit and is connected to the light outlets via at least one flexible light line. The housing containing the light source is located outside of the operating room, for example, above the ceiling of the operating room. The lighting unit in the case of this type of multi-eye operating lamp covers the upper part of the room so that the operating team working below is made to feel spacially restricted.

To reduce the psychological burden on the operator who feels spacially restricted by the lamp located above the operating area it has already been proposed to arrange the individual spotlights along a circular ring open at one point with a spotlight provided in the centre of the circular ring, each spotlight forming a unit having a cooling device through which refrigerant flows. An operating lamp of this type is suitable for all operations since it can be used for illuminating both large and small operating surfaces. However, as in the case of the known multi-eye operating lamps, a plurality of individual spotlights with bulbs, heat protection filters, reflectors and corresponding electrical lines have to be provided and this involves considerable expenditure on materials.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an operating lamp having a lightweight lighting unit which does not reduce the size of the illumination field, have a spacially restricting effect on the patient or the operator and does not have any disadvantages with respect to its use or lighting qualities over known operating lamps.

According to the invention this task is solved in that the ends of the light line project in the form of light outlets from the inner ring of the lighting unit. This unit is shaped in the form of a ring, is open on one side and is rotatably mounted in a fork rest. Since the lighting unit is in the form of a ring which is open on one side, the disadvantages of the known multi-eyed operating lamps having a closed surface, are avoided while the advantages of these types of lamps with respect to the absence of shadow and plastic vision in the illuminated area are retained. Furthermore, the lighting unit is of considerably lighter construction so that it is particu-

larly easy to adjust the overhead suspension means consisting of hinged brackets on account of the light weight of the unit.

The end surfaces of the light outlets are preferably inclined in respect of the horizontal plane of the operating lamp for the purpose of focussing the light rays in the operating area. As a result, the absence of shadow and plastic vision are ensured in the illuminated area. To increase the easy movement of the overhead suspension means, a light generator with a light source of counterweight to the lighting unit is arranged on the outside of the fork rest and is connected to a hinged bracket provided for suspending the operating lamp. As a result of this arrangement the torsional moments exerted on the one hand by the lighting unit and on the other hand by the light generator are largely compensated so that only the displacement forces have to be applied to tilt the lighting unit in the fork rest. The light lines consisting of bundled glass fibers are preferably disposed inside the fork rest, separating after one joint of the fork to form one strand for each of the two halves of the fork. The joint in question makes it possible to turn the operating lamp fork rest to the right or left. The strands are guided in a preferred way inside the hinge joint connecting the lighting unit to the fork rest.

In the case of another embodiment of the invention a light generator which is connected via light lines to the light outlets of the relevant half of the lighting unit, is provided in each half of the symmetrically constructed lighting unit adjacent to the hinge joint, about which the lighting unit is rotatable in the fork rest. By constructing the lighting unit in this way it is possible to place the light generators so close to the light outlets that the expensive light line can be kept as short as possible.

In addition, in the case of one embodiment the light generator is disposed in the plane of symmetry inside a lighting unit opposite the point of break-through of the same.

To increase the mobility of the operating lamp, the lighting unit consists preferably of two halves releasably connected by a coupling. A light generator is provided in each half of the lighting unit. In addition, the fork rest for receiving the lighting unit is also divided into two halves, each of which is pivotably connected via a hinge to the hinged bracket of the suspension means.

The advantage provided by the invention is that the flexible light lines are kept as short as possible and a plurality of light outlets are provided on a large non-continuous surface so that there is not a surface giving off heat immediately above the operator. Other advantages are the light construction of the lamp and the fact that it can be produced economically as only a filter element is required. Further details of the invention will now be described with reference to the embodiment represented in the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG 1 is a sectional plan view of an operating lamp with a light generator acting as counterweight,

FIG. 2 is a side view of the operating lamp according to FIG. 1,

FIG. 3 is a plan view of an embodiment having two light generators in the lighting unit,

FIG. 4 is a plan view of a modified embodiment with a light generator in the lighting unit,

FIG. 5 is a side view of the operating lamp according to FIG. 4,

FIG. 6 is a plan view of another embodiment of the operating lamp having a divided lighting unit and

FIG. 7 is a side view of the operating lamp according to FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An operating lamp is secured to the ceiling by a supporting pin 10 from which a horizontal hinged bracket 12 leads to a vertical hinged bracket 14. A light generator 18 is mounted at the lower end of the hinged bracket 14 in a housing from which a fork rest 30 projects horizontally. A lighting unit 34 is mounted so as to be swivellable on swivel joints 32 in the fork rest 30. The fork rest 30 is also adapted to be swivelled from the horizontal toward the top or bottom about an axis 24.

The electric circuit passes through the supporting pin 10 to the housing box of the light generator 18.

A light source 20, from which light lines 16 lead radially outwards, is provided in the middle of the spherical body of the light generator 18. The supporting fork rest 30 is connected to the housing of the light generator 18 via a connecting part 22 and is provided with a joint 25.

The flexible light lines 16, which, for example, are in the form of bundled glass fibers, divide into two lines 26, 28, after the joint 25. These two lines 26, 28 pass through the inside of each half of the fork. The light generator 18 acts as a counterweight to the fork 30 and the lighting unit 34. As a result, only light displacement forces are required to adjust the operating lamp. The fork rest 30 encircles a little more than half of the lighting unit 34. The lines 26 and 28 pass inside the swivel joints 32 into the inside of the lighting unit 34 where they divide again into the individual light lines 16, the ends of which project from the inner ring of the lighting unit 34 in the form of light outlets. The lighting unit 34 is in the shape of a ring which is open at the side opposite the light generator 18. The free surface enclosed by the inner ring of the lighting unit 34 gives the operator standing below the impression of the operating lamp having inside width and considerable lightness thus eliminating the psychological burden caused by the spacial restriction in the case of a conventional operating lamp of approximately the same size. Since the lighting unit 34 is open at one point it is possible for the operating lamp to be brought down to the operators' shoulder level and lower. This still allows sufficient space for the operator to move his arms at the open part of the lighting unit 34.

The faces of the light outlets 36 are inclined in respect of the horizontal in such a way that the rays of light being discharged at the bottom are focussed on the operating area. Largely shadow free illumination of the operating area with simultaneous plastic vision is thereby ensured.

FIG. 3 shows another embodiment of the operating lamp. As in the case of the lamp described above the embodiment shown in FIG. 3 is secured by means of the pin 10 (not shown) and the hinged brackets 12 and 14. The supporting fork rest 30 for receiving a lighting unit 40 leads from the horizontal hinged bracket 14. The fork rest 30 is swivellable about a joint axis 24 and

rotatable about a joint 25. The fork 30 has two straight branches, the ends of which are bent and parallel to one another. The lighting unit 40 is open at the point opposite the joint 25 and possesses a circular inner ring. The outer peripheral line of the lighting unit 40 largely follows the outline of the inner ring with the exception of next to the swivel joints 32 of the fork 30 about which the lighting unit 40 is swivellable. In the proximity of these swivel joints 32 the outline of the lighting unit 40 is parallel to the ends of the fork 30 so that the lighting unit 40 is sufficiently broad to house a light generator 18 for each of the halves of the lighting unit. Light lines 42 lead radially outwards from each light source at the circumference of the circular light generator unit and from there to the individual light outlets 36, which project from the surface of the lighting unit 40. By arranging the light generators 18 right inside the lighting unit 40 the advantage obtained is that the expensive, flexible, light lines can be kept as short as possible.

Another embodiment of the operating lamp is shown in FIGS. 4 and 5. The means for suspending this lamp from the ceiling of the operating room and the swivel fork for a lighting unit 44 correspond largely to those of the operating lamp according to FIG. 3. The lighting unit 44 is also open at one point. A single light generator 18 disposed in the centre of the lighting unit 44 is arranged opposite the open point. The ends of the flexible light lines 46 terminate in light outlets 36 which are distributed over the inner circular ring of the lighting unit 44 and which project from the same in order to focus the light beams 38 downwards onto the operating area.

In the case of another embodiment indicated in FIGS. 6 and 7, the operating lamps are suspended in a similar manner to the embodiments described above. The one difference between the embodiment shown in FIGS. 6 and 7 and those described previously is that the supporting fork rests consist of two fork halves 54, each of which is connected to a common hinged bracket 50 via a swivel joint 52. The common hinged bracket is hinged at the joint 25. The lighting unit of this operating lamp is also divided into two halves 60, which a coupling 58 releasably connects. The coupling 58 allows the halves of the lamp unit to be moved together or individually. A light generator 18 is provided in each half of the lighting unit 60. Light lines 62 lead from the light generator 18 to the individual light outlets 36 on the partial inner ring of each half 60. The light generators 18 are arranged along an axis of rotation, about which the lighting unit is swivellable in the supporting fork rest.

The halves of the fork 54 are swivellable about the joints 52 so that the distance between the halves of the lighting unit 60 can be altered. It is then easy to vary the breadth of the illuminated operating area.

We claim:

1. An operating lamp having a movable lighting unit suspended over the operating area, said light unit comprising a plurality of light outlets connected to at least one light source via flexible light lines, characterized in that the ends of the light lines 16 projecting from the inner ring of the lighting unit 34 in the form of light outlets 36, said lighting unit being circular in construction, open on one side and rotatably mounted in a fork rest 30, the end surfaces of the light outlets 36 being inclined in respect of the horizontal plane of the operat-

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ing lamp to focus the light beams 38 in the operating area, and further comprising a light generator 18 with a light source 20 disposed on the outside of the fork rest 30 and connected to a hinged bracket 14 provided to support the operating lamp, the light generator and light source acting as a counterweight to the light unit.

2. An operating lamp according to claim 1, characterized in that the light lines 16 consisting of bundled glass fibers are disposed inside the fork rest 30 and divide into one line 26 and 28 for each half of the fork after the joint 25.

3. An operating lamp according to claim 2, characterized in that the lines 26,28 which connect the lighting unit 34 to the fork 30 pass through the inside of the swivel joints.

4. An operating lamp having a movable lighting unit suspended over the operating area, said light unit comprising a plurality of light outlets connected to a least one light source via flexible light lines, characterized in that the ends of the light lines 16 project from the inner ring of the lighting unit 34 in the form of light outlets 36, said lighting unit being circular in construction, open on one side and rotatably mounted in a fork rest 30, the light source comprising a light generator

mounted inside the inner ring of the lighting unit opposite the open side of the lighting unit and centrally disposed on a plane of symmetry of the lighting unit, the light generator and light source acting as a counterweight for the inner ring of the lighting unit.

5. An operating lamp having a movable lighting unit suspended over the operating area, said light unit comprising a plurality of light outlets connected to at least one light source via flexible light lines, characterized in that the ends of the light lines 16 project from the inner ring of the lighting unit 34 in the form of light outlets 36, said lighting unit being circular in construction, open on one side and rotatably mounted in a fork rest 30, the inner ring of the lighting unit comprising two halves releasably connected by a coupling, and the light source comprising a light generator mounted in each half of the inner ring.

6. An operating lamp according to claim 5, characterized in that the fork for receiving the lighting unit is divided into two halves 54 each of which is swivellably connected with a hinged bracket 50 of the suspension means via a joint 52.

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