

[54] **SURGICAL OPERATING LAMP WITH INDIVIDUAL SPOT-LIGHTS**

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[22] Filed: **Jan. 24, 1974**

[21] Appl. No.: **436,256**

[57] **ABSTRACT**

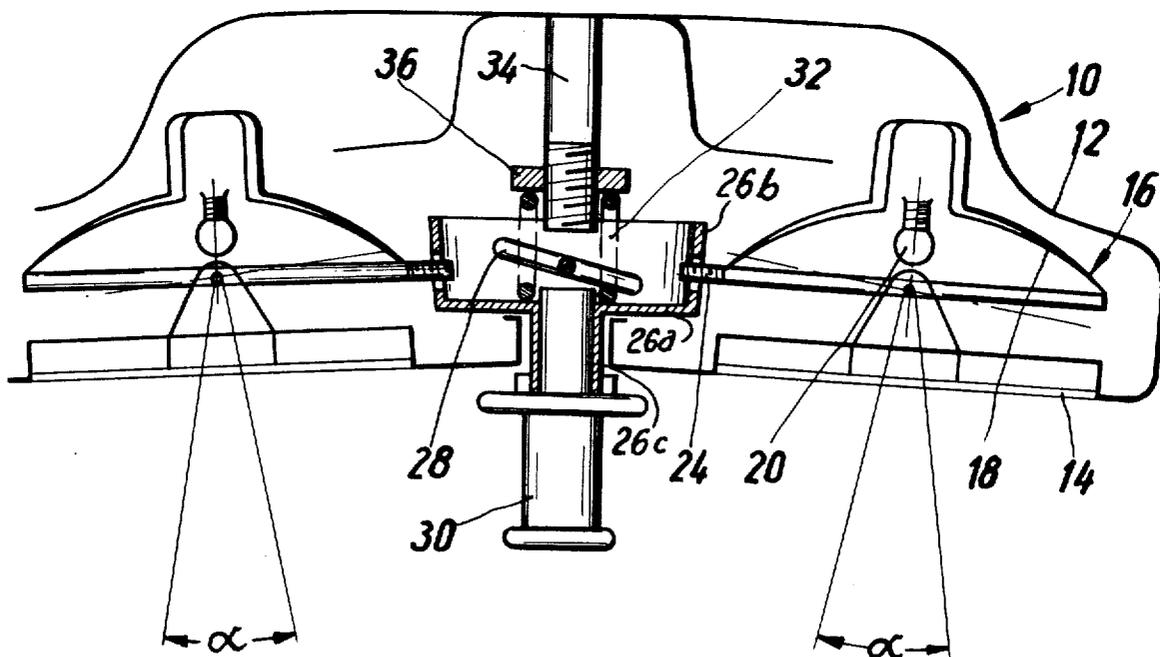
[30] **Foreign Application Priority Data**
Feb. 6, 1973 Germany..... 2305666

The present invention relates to a surgical operating lamp with individual spot-lights disposed around a central axis of the lamp, the light rays of said spot-lights meeting approximately on this axis and at a desired distance from the surgical operating lamp, as a result of an adjustable inclination of the individual projectors to the central axis. A single handle adjusts all the individual spot-lights in the lamp.

[52] U.S. Cl. 240/1.4; 240/41.15; 240/44
[51] Int. Cl. A61g 13/00; F21v 33/00
[58] Field of Search..... 240/1.4, 41.15, 44

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7 Claims, 2 Drawing Figures



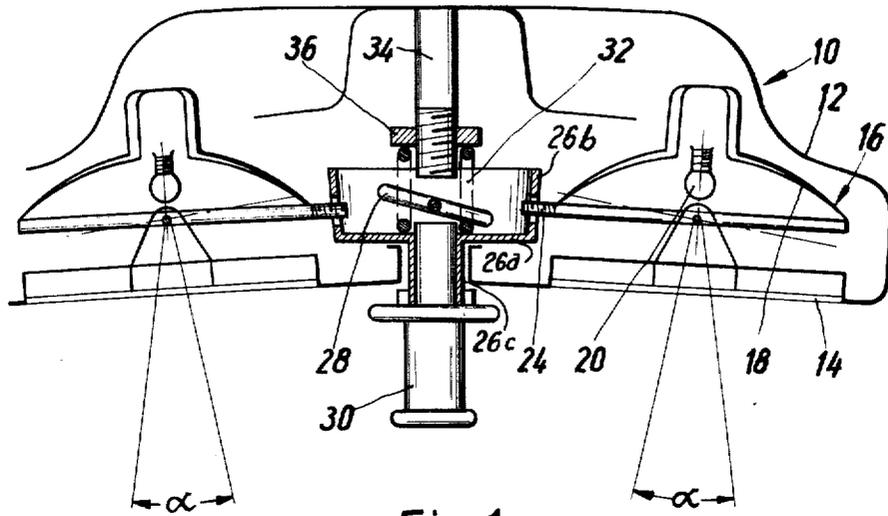


Fig. 1

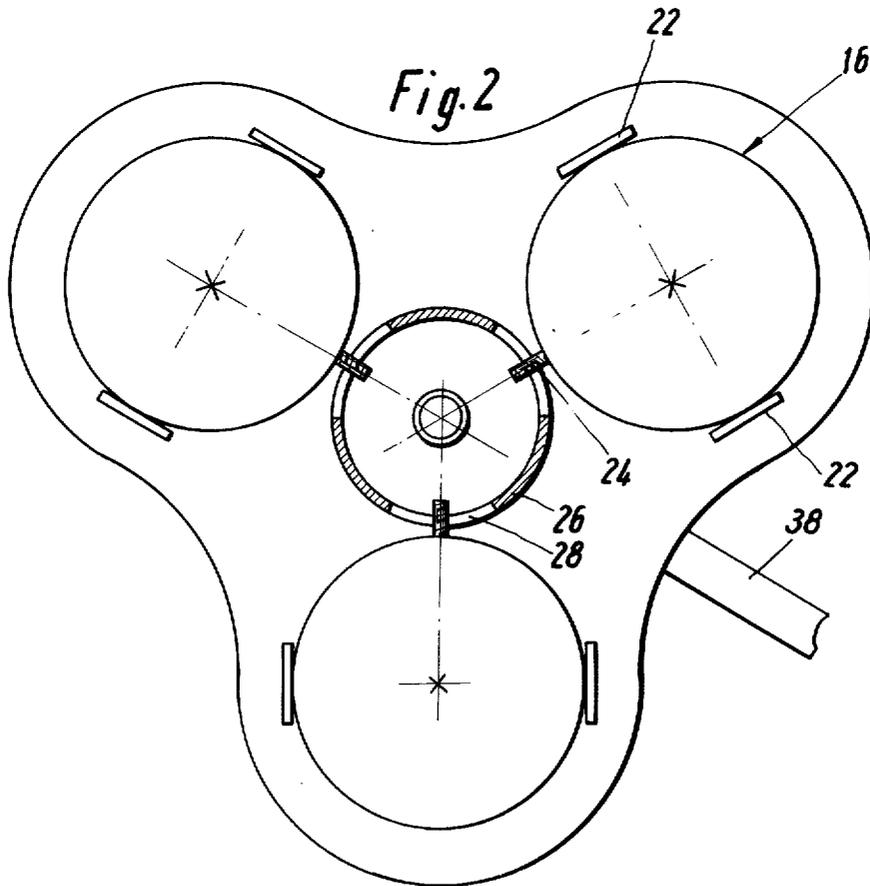


Fig. 2

SURGICAL OPERATING LAMP WITH INDIVIDUAL SPOT-LIGHTS

BACKGROUND OF THE INVENTION

In a known method, in order to obtain a shadowless lighting of the operating area, several individual projectors are disposed on a spherical surface within a surgical operating lamp so much apart from each other and focused in such a way that the surgeon can operate in the operating area without the hindrance of shadow effects. For this purpose, for instance, a certain amount of individual projectors, circularly spaced, can be equally disposed around the central axis of the surgical operating lamp, their light rays meeting on this axis by an appropriate inclination of the individual projectors towards the said axis. However, should the distance between the surgical operating lamp and the operating area have to be modified, this arrangement is inappropriate, in order to guarantee at all times a focusing of the individual light rays onto the operating area. On the one hand, an illumination as effective as possible of the operating area is thereby to be achieved, but on the other hand, it is undesirable that the peripheral areas, which are mostly covered with white cloths, to be strongly illuminated, which could cause a glare and therefore a hindrance to the surgeon.

For the purpose of obtaining a variable focusing in the case of surgical operating lamp with symmetrically distributed individual spotlights as well as with a central light disposed in the central axis of the surgical operating lamp, it is known to incorporate a joint swiveling device of the individual projectors, operable from outside, with which the distance between the lamp housing and the spot at which the optical axes of the individual projectors meet is adjustable. An adjusting support for the reversals of the lamp protrudes, in the form of a lateral bearing, serving for the suspension of the lamp and adjustable by turning it at that spot. The turning is transmitted through the adjusting support to a toothed rim by means of a pinion disposed towards the central lamp, a steering rod gearing also articularly to the proper swiveling individual projector or to the circularly curved guide rail of an adjustable individual projector. Since, due to the overlength of the rods, these do not run radially and on the symmetrical axis of the surgical operating lamp, a radial displacement component is transmitted to the individual projectors by the turning of the pinion, whereby these change their position jointly and evenly, so that the point of intersection of the optical axes on the symmetrical axis of the surgical operating lamp can be shifted.

An important disadvantage of the known surgical operating lamps is that these are of a complicated construction, consisting of numerous component parts, and enable only a shifting and an adjustment which are not linear, due to their special shift of motion, so that, with a given adjusting turning angle, a different shift of the point of intersection of the optical axes from the surgical operating lamp occurs depending on the initial position of the adjusting mechanism. In some areas, a precise shifting and adjustment is possible, whereas in other areas the operator must further turn the adjusting support in order to obtain the same shifting effect. Such an operation is complicated as well as hindering, since the surgeon must concentrate himself completely on the patient and the shifting and adjustment of the surgical operating lamp represent a very important task but,

after all, only a secondary one. Furthermore, especially in the case of large surgical operating lamps, the lateral access to the means of shifting and adjustment is not optimal.

SUMMARY OF THE INVENTION

The object of the invention consists in the creation of a surgical operating lamp of the mentioned type, without a central light, whereby the individual spot-lights can be completely linearly shifted and adjusted, at least in the main area, in a simple manner and are easily accessible. The surgical operating lamp should be simple in design, and therefore inexpensive, and contain only a few component parts needing no servicing. Furthermore, the arrangement should be so selected that the operating lamp is as compact as possible, in order to oppose as little a resistance as possible in the operating theatre or in an operating cabin to an air current serving as sterilizer and directed from top to bottom, parallel to the lighting circuit.

The solution to the task in question is attained by a surgical operating lamp of the mentioned type, in that each individual lamp assembly is pivotally attached to the surgical lamp structure and has a pin extending from one side which engages a central slotted cam member which is rotatable from below the lamp.

The most important advantage of the invention is that it makes it possible to attain a completely linear shifting and adjustment of the individual lights by turning in a simple manner the slotted cam member disposed in the center of the lamp and accessible from below. As the pins on the lights are directly engaged with the slots in the cam member, without the need of any other intermediate link, the whole surgical operating lamp is uncomplicated and inexpensive in construction, and allows a compact arrangement of the individual lights. As compared with the known surgical operating lamps with adjustable individual lights, the new surgical operating lamp can be constructed considerably smaller, so that the sterilizing air current is only slightly impaired. Since the slotted cam member can be directly rotated from below, it can also serve to adjust the whole surgical operating lamp in its suspension.

DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a sectional view of a surgical operating lamp according to the present invention.

FIG. 2 shows a sectional view of the surgical operating lamp of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A surgical operating lamp 10 has a housing 12 closed towards the top, at the lower side of which windows 14 are disposed in the area of each individual lights 16. Each individual light 16 houses a bulb 20 disposed in a lamp spot-light 18. Each of the individual lights 16 are pivotally attached to mounts 22 attached to the lower portion of housing 12. The pivoting axis of each light is tangent to a common circle around the central axis of the surgical operating lamp 10. Each individual projector 16 is also provided with a pin 24 which is disposed at the spot nearest to the central axis of the surgical operating lamp 10. The pin 24 engages slot 28, in a slotted cam member 26, disposed centrally and rotatable from below by way of handle 30.

The slotted cam member 26 is formed with intermediate wall 26a, upper wall 26b having a plurality of cam slots 28 therethrough and lower wall 26c to which is attached handle 30. The number of cam slots 28 correspond to the number of individual lights 16 used in the operating lamp. Lower wall 26c of slotted cam 26 is projected to the outside of the lamp through an opening at the lower side of the surgical operating lamp. Handle 30 is attached to lower wall 26c such that it transmits torque to the cam member 26, but may be removed therefrom to facilitate sterilization.

The slotted cam 26 is prevented from inadvertent rotation by spring 32, which frictionally bears against intermediate wall 26a and adjustable stop 36. The position of stop 36 relative to cam member 26 is variable by screw connection on a bolt 34. As a result thereof the friction catch for the avoidance of involuntary displacement of the individual projectors 16 can be adjusted to the prevailing requirements.

Depending on the length and the gradient of the slots 28, a greater or smaller maximum surveiling angle α of the individual projectors 16 can be attained. When the skewed slots 28 are greatly inclined, a great change in the inclination of the individual spot-lights 16, and thereby a great change in the position of the point of intersection of the optical axis is generated by a small rotation of the adjusting handle 30. In order to attain a shifting and an adjustment not too sensible and, furthermore, needing no energy, it is proper to select not too great an inclination. However, if too small a gradient is selected, the length of the slots 28 needed to affect a constant swiveling angle α , becomes too great and the sensibility of the shifting and adjustment drops too much. As a practical matter, a gradient of the slots 28 of approximately 10° to 15° has proven to be adequate.

Besides the straight slots 28 of the above example type, in order to attain a linearly shifting and adjustment over the whole area, it is also possible, to give a fine shifting and adjustment to the surgical operating lamp in the central area mainly used, and a rough shifting and adjustment in the end areas seldom used, to attain the maximum swiveling angle α . A reverse arrangement is also possible, by which the shifting and adjustment are quicker in the central area and slower in the end area or areas.

The surgical operating lamp 10 is suspended from rod 38 by means of known type which permit angular adjustment of the lamp assembly.

In the example type represented, a surgical operating lamp with three individual lights 16 is used, said lights being disposed at 120° from each other around a star-shaped lighting body. Thereby the housing 12 encloses the individual projectors 16 and is indented between them, so that the area of the surgical operating lamp 10 hereby submitted to the sterilizing air current is relatively small. Of course, the surgical operating lamp can also have any amount of individual lights 17 and, in such case a circular housing 12 may be used.

The adjusting handle 30 can be connected to lower wall 26c to transmit torque therebetween and still be released for sterilizing purposes of the surgical operating lamp. The central adjusting handle 30 serves, on the one hand, for the swiveling and adjustment of the whole surgical lamp 10 with respect to support 38, and, on the other hand, for the focusing of the individual

projectors 16. Its central position enables an easy access in each position of the surgical operating lamp 10.

The main advantage of the new surgical operating lamp consists in that the shifting and adjustment of the individual projectors, and thus, the focusing, can be attained completely linearly and with a compact construction of the surgical operating lamp, with less and simpler means than with the known surgical operating lamp. Thereby the adjustment of the inclination of the individual lights occurs over a joint and central adjusting handle of easy access and which is easily removable and can be rapidly sterilized in case of need.

What is claimed is:

1. In a surgical operating lamp having a housing with at least one hole therethrough and a plurality of individual lights pivotally mounted within said housing and disposed about a central axis of the lamp such that the rays of each individual light meet on the central axis at a desired distance from the lamp, the improved lamp pivoting means comprising

- a. cam means within the housing having an annular intermediate wall oriented perpendicular to the central axis of the lamp, an upper wall attached to the outer periphery of said annular intermediate wall and extending in a first direction, said upper wall having a plurality of slots therethrough defining a plurality of cam surfaces, the longitudinal axes of said slots inclined with respect to the central axis of said lamp, and a lower wall attached to the inner periphery of said annular intermediate wall and extending in a direction opposite that of said upper wall, said lower wall pivotally extending through the hole in said lamp housing;
- b. a handle attached to said lower wall and extending exteriorly of said lamp housing; and
- c. pins affixed to each individual light and bearing on one of the cam surface of said cam means, such that rotation of said handle produces a corresponding rotation of said cam means which thereby causes said lights to pivot about an axis tangent to a common circle drawn about the central axis of the surgical operating lamp.

2. The improved surgical operating lamp of claim 1 wherein said slots are linear.

3. The improved surgical operating lamp of claim 2 wherein the longitudinal axis of said slots are at an angle of from 75° to 80° with respect to the central axis of the lamp.

4. The improved surgical operating lamp of claim 1 wherein the longitudinal axis of said pins are 90° with respect to the pivot axis of the individual lights.

5. The improved surgical operating lamp of claim 1 wherein said handle means is releasably attached to said lower wall.

6. The improved surgical operating lamp of claim 1 wherein frictional anti-rotation means are interposed between said housing and said cam means to prevent inadvertent rotation of said cam means.

7. The improved surgical operating lamp of claim 6 wherein said frictional anti-rotation means comprises a spring having one end bearing against said cam means and the opposite end bearing against adjustable stop means threadingly engaged with a bolt projecting through the top of said housing.

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