

May 1, 1951

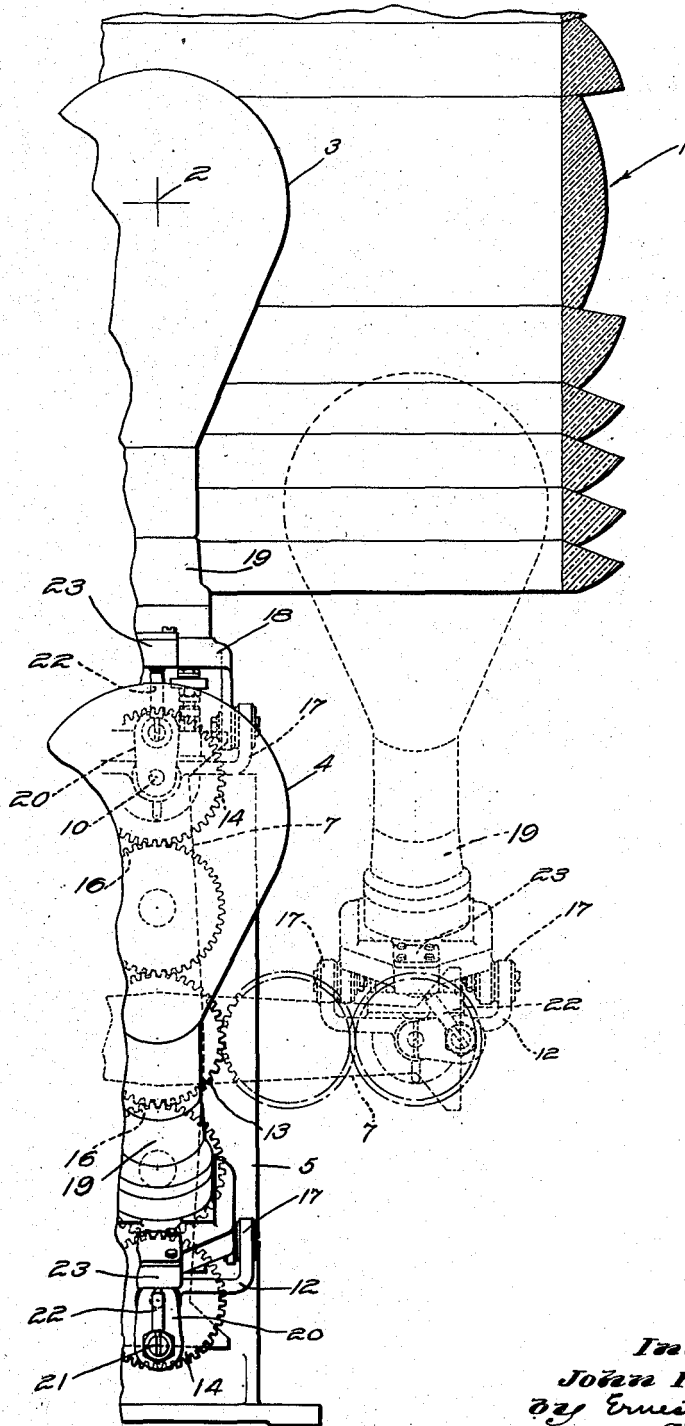
J. R. MacKAY
LAMP CHANGER CONSTRUCTION

2,551,029

Filed Oct. 5, 1946

3 Sheets-Sheet 1

Fig. 1.



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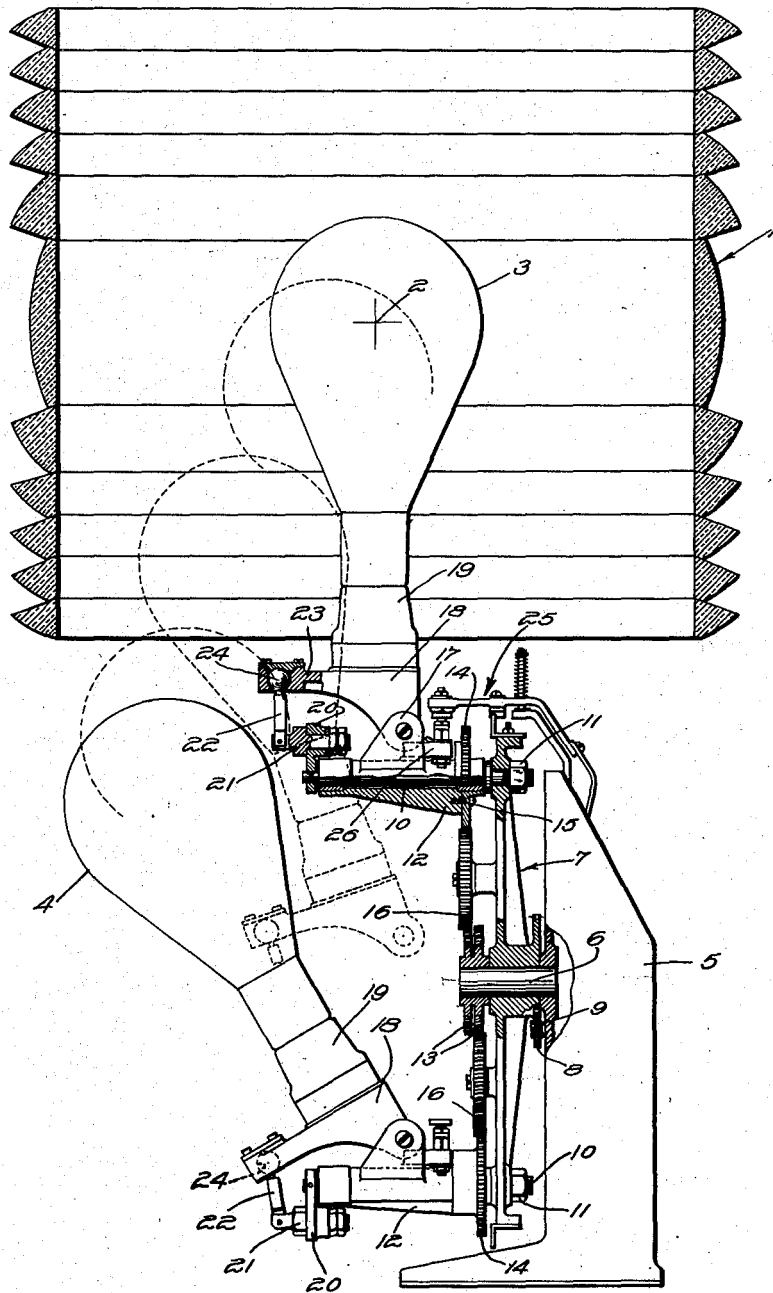
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Fig. 2.



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Fig. 4.

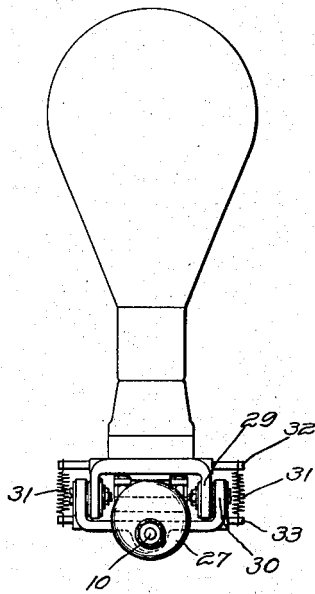


Fig. 5.

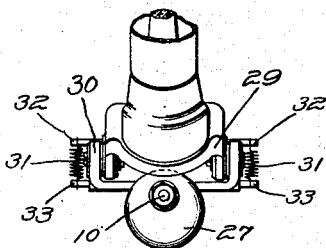
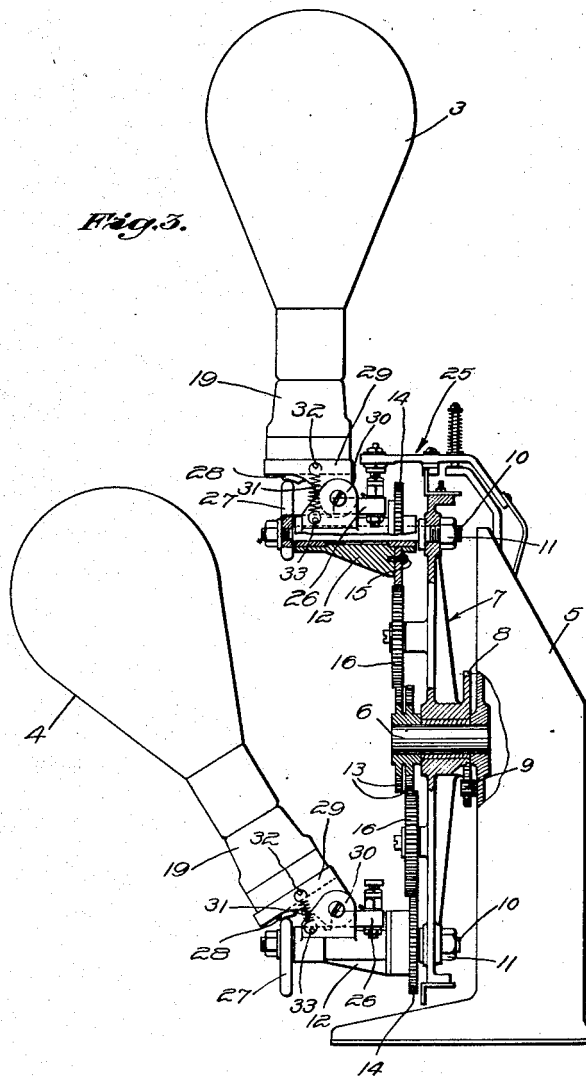


Fig. 3.



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UNITED STATES PATENT OFFICE

2,551,029

LAMP CHANGER CONSTRUCTION

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Application October 5, 1946, Serial No. 701,430

7 Claims. (Cl. 240—37.1)

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My present invention relates to lampchanger construction and more particularly to certain apparatus for supporting and providing for the interchange of electric lamps, particularly of large size, which are arranged to be associated with a lighting system such as an aviation or marine beacon. Such apparatus is disclosed in substantial detail in my prior Patent No. 2,289,315, granted July 7, 1942, which discloses not only a lampchanger construction generally but also the operating means therefor.

The present invention is particularly adapted for use with apparatus as generally disclosed in my prior patent aforesaid and to use operating means such as are particularly disclosed in that patent. For this reason the operating means per se have not been disclosed hereinafter, but reference may be made to my prior patent for a full and complete disclosure of practical means by which the apparatus of the present invention may be actuated.

Reference is also made to my copending application, Serial No. 701,429, filed October 5, 1946, and entitled "Lampchanging Apparatus," wherein there is disclosed a construction for this same general purpose, but with a somewhat different type of operating means. In this copending application the lampchanging arm, instead of being rotatable intermittently but in a unidirectional manner, is moved automatically through a predetermined arc and then may be manually re-set by a reverse movement to its initial position.

In general, devices of this kind are so arranged that when one lamp, in an operating position, burns out or fails for some reason, the lampchanging apparatus is moved so as to position the other or a second lamp in an operating position at which its center of illumination is at a predetermined point, which point is usually the focal point of a lens or lens system. The present apparatus is intended for this general purpose.

In my prior Patent No. 2,289,315 aforesaid, a lampchanger construction is disclosed adapted for relatively small sized lamps, at least in proportion to the size of the apparatus therein disclosed. However, when substantially larger sized lamps are employed such, for example, as those known as PS-40 or PS-52 envelope lamps, it is necessary either to use a much larger sized mechanical apparatus in order to employ a structure as shown in the prior patent aforesaid, or to make other special provisions not disclosed in that patent to prevent interference of the parts and consequent inevitable breakage of lamps and/or other parts of the apparatus.

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A primary object of the present invention therefore is to provide means by which a standard sized apparatus of a type as generally set forth in my prior patent aforesaid may be adapted for use with substantially larger sized lamps than those for which that apparatus was originally designed.

A further and more specific object of the present invention is to provide for the movement of lamps carried by a lampchanging apparatus as aforesaid in directions generally laterally of the principal plane of movement of the lamps; or more particularly, when the lamp carrier is rotated about a horizontal axis, for movement of the lamps laterally in respect to a vertical plane including the position of the center of illumination of the lamps at their operative position, which plane would be perpendicular to the axis of rotation of the lamp carrier.

A further object of the present invention is to provide for this lateral movement particularly by tilting the lamps in respect to the vertical and in a direction perpendicular to the plane aforesaid, preferably in response to the movement of the lamp carrier.

Further and detailed objects of the present invention include the provision of specific tilting means; for example, cam operated means responsive to the rotation of the carrier and co-operating with each lamp individually to tilt it a desired amount during the rotation of the carrier, so as to insure that it will move in a path out of contact with any other parts of the apparatus.

A further object is to provide another and modified construction by which the tilting may be effected positively by a direct mechanical linkage in response to the carrier rotation.

Other and more detailed objects of the present invention will appear from the following description and appended claims, when considered in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary view principally in front elevation illustrating a form of lampchanging device wherein the lamps are tilted by a positive mechanical linkage;

Fig. 2 is a view of the apparatus of Fig. 1 principally in central vertical section, but with some parts shown in side elevation as seen from the right of Fig. 1;

Fig. 3 is a view similar to Fig. 2 showing a modified form of the invention wherein the tilting is effected by a cam associated with each lamp;

Fig. 4 is a fragmentary detail view as seen from

the left in Fig. 3 showing the mounting of one of the lamps; and

Fig. 5 is a view similar to that of Fig. 4, but with the lamp in a tilted position in respect to that shown in Fig. 4, corresponding substantially to the position of the lower lamp as shown in Fig. 3 as seen from the left in that figure.

Considering first the form of the invention shown in Figs. 1 and 2, there is illustrated in part a lampchanging apparatus arranged to be applied to a type of structure as particularly shown in my prior Patent No. 2,289,315 aforesaid. The primary difference, however, between the present arrangement and the patented structure is that in the present arrangement the lamps are not maintained vertical throughout the movement of the carrier as in the patented structure, but are progressively tilted from the vertical in a direction laterally of a plane perpendicular to the axis of rotation of the lamp carrier and containing the focal point of the lens or lens system, which point is preferably and usually the same as the point at which the center of illumination of each lamp occupies at the operative position thereof.

There is shown in Figs. 1 and 2 a Fresnel lens 1 having a focal point at 2. A lamp 3 is shown at its operative position with its center of illumination at the point 2. A second lamp is shown at 4 at its inoperative position when the lamp 3 is at its operative position. There are but two lamps mounted on the structure as shown in the accompanying drawings, although it is contemplated that a structure similar to that herein shown could be provided for the accommodation of more than two lamps, using the same principles of construction and operation. Various intermediate positions of the lamps 3 and 4 are indicated in dotted lines in Figs. 1 and 2.

As particularly shown in Fig. 2, the main movement of each lamp is in a vertical plane perpendicular to the plane of the paper and passing through the point 2. However, the lamps are tilted in moving between the operative position thereof shown for the lamp 3 in Fig. 2 and the inoperative position shown for the lamp 4 by a progressive amount, so that the longitudinal axes of the lamps are progressively further from the vertical as the lamps are progressively moved from their operative position to a position 180° distant therefrom in the movement of rotation of the lamp carrier, and vice versa. This tilting movement enables the large lamps shown to avoid contact not only with each other, but also with other parts of the structure as particularly illustrated in Fig. 2, while permitting these large lamps to be used with a relatively small lamp-changer structure adapted for and usable with lamps of much smaller size. In this way it is possible to make many of the parts of a single size and shape for each part irrespective of the size lamps to be used therewith, which results in economy in manufacturing operations.

Referring now more particularly to the drawings, the stationary support for the lampchanging device is shown at 5, this structure corresponding to the structure 10 of my prior patent aforesaid. Rigidly mounted in this support is a stationary stud 6 about which a lamp carrier generally indicated at 7 may rotate, the axis of the stud 6 preferably being horizontal as shown.

The carrier 7 may be rotated by any suitable means (not shown), for example, means such as are shown in my prior patent, but not here shown in detail, such means being in general indicated

by a ring gear 8 secured to the carrier 7 and meshing with a pinion 9, which may be suitably connected to a driving mechanism, for example, of the type shown and described in detail in my prior patent. If it be desired to provide for the oscillation rather than unidirectional rotation of the carrier 6, some well known type of "free-wheeling" device may be arranged in conjunction with driving mechanism of the type of my prior patent so as to permit manual re-setting of the carrier 7 after it has moved through an angle as 180°, such as a friction clutch or a pawl and ratchet device as shown at 71—72, Fig. 7, of my copending application Serial No. 701,429 aforesaid. On the other hand, any suitable spring actuated device such as that particularly described in my copending application Serial No. 701,429 aforesaid, and including a torsion spring as shown at 51 in Fig. 5 of that application, located at any convenient part of the device may be used. Alternatively, a weight-actuated mechanism may also be used as will be obvious to those skilled in the art. It will be understood that as to the present invention, the specific type of actuating means for the carrier is relatively immaterial and per se forms no part of the present invention.

While in the event that oscillatory movement were used for the carrier, as through 180°, there would usually be required a stop means for predetermining accurately the terminal positions of the carrier movement, the present invention is arranged and intended for unidirectional rotation. Such stop means are, therefore, not included in the present disclosure. Reference may be had, however, for a disclosure of such means to Figs. 10 and 11 of my copending application, Ser. No. 701,429 aforesaid, and the associated description. With a unidirectional driving means for the lamp carrier, means are preferably provided for insuring the accurate registry of each lamp in succession at an operative position as shown in the drawings, Figs. 1 and 2, for the lamp 3. Such means are disclosed in detail in my prior patent aforesaid and will not here be repeated.

In accordance with the present invention the lamp carrier 7 carries rigidly secured therein adjacent to its outer ends a pair of horizontally disposed studs 10, which are secured to the carrier as by nuts 11. Pivoted about each of these studs is a lamp carrying means 12. These means 12 carry the lamps 3 and 4 in a manner more particularly hereinafter described.

Means are provided for rotating the means 12 about the horizontal axes of the studs 10 in response to and proportional with the rotation of the carrier 7 about its axis stud 6. In general means similar to either of the arrangements shown in my prior patent aforesaid can be used for this purpose; that is, either a train of gears as particularly shown in the accompanying drawings, or sprocket and chain means as shown, for example, in Figs. 1, 2 and 4 of my prior patent. The essential characteristic is that a parallel motion drive be provided for the lamp carrying means 12 so that their upper surfaces will always be maintained horizontally or at some definite angle to the horizontal in accordance with the requirements of the present invention.

For this purpose as shown in the accompanying drawings there is provided a gear means here shown as a pair of gears 13 concentric with the stud 6 and preferably splined to this stud, so as to be non-rotatable in respect to the stationary

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support 5. While two such gears are shown in the accompanying drawings, it will be understood that only one such gear need necessarily be provided. Each of the lamp carrying means 12 is provided with a gear 14 secured thereto as by one or more screws 15. The gears 14 are arranged concentric with the studs 10. Intermediate the gear or gears 13 and the gears 14, there are one or more idlers, as may be necessary, an uneven number being required so that the movement of the means 12 and the lamps carried thereby will be a parallel motion linkage or drive. In this case but one intermediate idler gear is shown at 16 associated with each gear 14, this idler being loosely pivoted upon a pintle carried by the carrier 7 and meshing with a gear 13 on the one hand and with an associated gear 14 on the other. As the gears 13 and 14 have the same number of teeth, it will be seen that the lamp carrying means 12 will always be maintained in a constant position in respect to the horizontal by the parallel motion linkage or drive described.

The particular description thus far given is essentially the same as the disclosure of my prior patent aforesaid and is common to both forms of the present invention herein particularly disclosed, so that the parts thus far particularly described have been given the same reference numbers.

Means are provided in accordance with the present invention for mounting each of the lamps for movement about a horizontal axis in respect to their associated lamp carrying means 12. For this purpose each means 12 is provided with a pair of upstanding ears 17 between which is pivoted a lamp supporting means 18, which in turn carries a conventional socket 19 in which the lamp is held in the usual manner. The pivotal connection between the ears 17 of the means 12 and the supporting means 18 is about a horizontal axis lying in a plane parallel to the vertical plane of rotation of the carrier, so that by tilting the lamps from the position of the lamp 3 of Fig. 2 to that of the lamp 4 in that figure the lamps will be moved outwardly or laterally of that vertical plane so as to avoid mechanical interference of parts as shown.

Means are provided for controlling the tilting of the lamps. For this purpose as shown in Figs. 1 and 2 a direct connection mechanical linkage is provided. This linkage comprises a crank 20 rigidly carried by the outer end of the stud 10 and having at its outer end a swivel member 21 rotatable in respect to the crank 20 about a horizontal axis parallel to the axis of the stud 10. This swivel member is connected by a link 22 to an extension 23 rigid with the lamp supporting means 18. The link 22 may be provided at its outer end with a ball end portion 24 received in a suitable substantially spherical seat in the extension 23 as shown.

Thus as the stud 10 is stationary in respect to the carrier 7, the crank 20 will always be maintained at the same angular position in respect to the lamp carrier 7 and thus will move in respect to the associated means 12 as shown by a comparison of the upper and lower portions of Fig. 2. This movement will cause a tilting of the lamps between the positions for the lamps 3 and 4 as shown.

The means shown in the accompanying drawings for conducting electric current to the several lamps may be identical with that fully disclosed in my prior Patent No. 2,289,315 above

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referred to, and is, therefore, not particularly described herein, such means being in general indicated by the reference number 25. The lamp carrying means 12 are provided with a suitable insulating block 26 for carrying the contacts moving with the lamps, which contacts are suitably connected by means, not shown, to the contact points or terminals of the sockets 19. Flexible connectors are required in this case to permit of the tilting movement of the lamps.

Referring now to the form of the invention shown in Figs. 3 to 5, there is provided a modified mechanical arrangement for attaining the same or similar results to those attained in the Fig. 1 form of the invention. However, some further advantages may be obtained from this type of structure. As shown, the outer end of each of the studs 10 carries rigidly secured thereto a cam 27 arranged to contact a preferably hardened surface of a projection 28 serving as a cam follower, this projection being formed rigidly or integral with a part of a lamp supporting means 29 corresponding in general to the means 18 of Figs. 1 and 2. Each lamp supporting means 29 is pivoted on a horizontal axis to upstanding ears 30 of the lamp carrying means 12 corresponding structurally and functionally to the ears 17 previously described, the pivotal connection being essentially the same in both forms of the invention.

Means are provided for resiliently retaining the supporting means 29 in a position such that a cam follower surface of the projection 28 is always in engagement with the cam 27. For this purpose one or more tension springs as shown at 31 are provided, these springs being connected between suitable projections provided for the purpose, and secured in the lamp carrying means 12 and the supporting means 29 respectively as shown at 32 and 33.

Thus as the cams 27 are held rigid with the lamp carrier 7, they will be rotated in respect to the lamp supporting means 29 as the carrier rotates. If then the cams 27 are circular in contour, but eccentrically held on the studs 10, substantially the same type of movement of the lamps 3 and 4 will ensue as previously described in connection with Figs. 1 and 2. On the other hand it may be desired, for example, in order to accommodate the device to particular space requirements for a lens or lens system or for other associated parts or equipment to provide some non-circular contour for the cams 27. This may obviously be done, the space restrictions being taken into account in the design of the cams 27 so as to obtain the desired results. Furthermore, these cams may be removable and interchangeable, so that a set of cams may be employed peculiarly adapted to any size or shape of lamps to be used and further to the space restrictions or requirements of any particular installation. This is a special advantage for this form of the invention giving it more universal application than the other form as shown, for example, in Figs. 1 and 2.

While there is shown and described herein but two specific forms or embodiments of the present invention and some variants are further suggested, others will obviously occur to those skilled in the art. I do not wish to be limited, therefore, except by the scope of the appended claims, which are to be construed validly as broadly as the state of the prior art permits.

What is claimed is:

1. Lampchanging apparatus, comprising a sta-

tionary support, a rotary lamp carrier means mounted on said support for movement in respect thereto about a predetermined axis, a plurality of electric lamps mounted on said carrier means and movable in respect thereto in the plane of rotation of said carrier means about said axis and also laterally of said plane, each of said lamps being carried in a base means, an intermediate supporting member interconnected between said lamp carrier means and each said base means respectively and including a pivoted connection about an axis parallel to the first named axis as the connection between each said intermediate member and one of said means, permitting relative movements of said lamps in respect to said carrier in said plane, and a connection between said supporting member and the other of said means, permitting relative movement between said lamps respectively and said carrier in a direction normal to said plane, means operated by and in response to the rotation of said carrier for moving said lamps in respect thereto in said plane, and other means operated by and in response to the rotation of said carrier for moving said lamps in respect thereto and for controlling the position of said lamps in directions normal to said plane, so as to move said lamps successively to and from predetermined operative positions at which their centers of illumination are successively at a predetermined point and inoperative positions spaced therefrom both in and laterally of said plane.

2. Lampchanging apparatus, comprising a stationary support, a rotary lamp carrier mounted on said support for movement in respect thereto about a predetermined axis, a plurality of electric lamps mounted on said carrier and movable in respect thereto in the plane of rotation of said carrier about said axis and also laterally of said plane, a base means carrying each of said lamps, an intermediate supporting member interconnected between said lamp carrier and each said base means respectively and including a pivoted connection between each said intermediate supporting member and said lamp carrier providing for the movement of each said intermediate supporting member in respect to said lamp carrier about an axis parallel to the first named axis of said lamp carrier, and a connection between each said supporting member and each said base means respectively providing for the movement of said base means and a lamp carried thereby in a direction normal to said plane, means operated by and in response to the rotation of said carrier for moving said lamps in respect thereto in said plane, and other means operated by and in response to the rotation of said carrier for moving said lamps in respect thereto and for controlling the position of said lamps in directions normal to said plane, so as to move said lamps successively to and from predetermined operative positions at which their centers of illumination are successively at a predetermined point and inoperative positions spaced therefrom both in and laterally of said plane.

3. Lampchanging apparatus, comprising a stationary support, a rotary lamp carrier mounted on said support for movement in respect thereto about a predetermined axis, a plurality of electric lamps mounted on said carrier and movable in respect thereto in the plane of rotation of said carrier about said axis and also laterally of said plane, an intermediate supporting member for each of said lamps respectively which is pivoted

to said lamp carrier on an axis parallel with the axis of rotation of said carrier, a base means for each of said lamps respectively pivoted to the respective supporting members on an axis which is maintained horizontal and which is perpendicular to the axis between said carrier and said supporting means respectively, parallel motion means operated by and in response to the rotation of said carrier for moving said lamps in respect thereto in said plane, and other means operated by and in response to the rotation of said carrier for moving said lamps in respect thereto and for controlling the position of said lamps in directions normal to said plane, so as to move said lamps successively to and from predetermined operative positions at which their centers of illumination are successively at a predetermined point and inoperative positions spaced therefrom both in and laterally of said plane.

4. Lampchanging apparatus in accordance with claim 3, wherein the last named means for tilting said lamps in response to the rotation of the carrier comprises a cam rotated in respect to each lamp incident to the rotation of the carrier, and cam follower means associated with each lamp for controlling the tilting thereof as the carrier rotates.

5. Lampchanging apparatus in accordance with claim 3, wherein the last-named means for tilting said lamp in response to the rotation of said carrier comprises a cam removably secured to an axle stationarily carried by said carrier and about which said lamp carrying means is rotatably mounted, means stationarily located in respect to each lamp for engaging the peripheral surface of said cam, and resilient means for retaining the cam engaging means in contact therewith, whereby as each of said lamps and its associated carrying means are rotated in respect to their associated axles and cams, the lamps are tilted laterally of said carrier.

6. Lampchanging apparatus in accordance with claim 3, wherein the last-named means for tilting said lamps in respect to said carrier incident to the rotation thereof comprises a positively acting mechanical linkage operating in response to the rotation of each lamp in respect to said carrier about the respective horizontal axis of each of said lamps, said linkage being effective positively in both directions to tilt said lamps incident to the movement of said lamp carrier.

7. Lampchanging apparatus, comprising a stationary support, a rotary lamp carrier mounted on said support for movement in respect thereto about a substantially horizontal axis, at least two electric lamps mounted on said carrier on lamp carrying means which are pivoted to said carrier for movement in respect thereto about horizontal axis studs rigid with said lamp carrier and diametrically symmetrically disposed in respect to the axis of said carrier, means mounting each of said lamps for movement in respect to its associated carrying means about an axis lying in the direction perpendicular to the axis of each of said carrying means in respect to said lamp carrier, parallel motion means subject to the rotation of said lamp carrier for rotating each lamp and its associated carrying means in respect thereto about the horizontal axes of said studs incident to the rotation of the carrier; and means for tilting said lamps in a direction lateral of said carrier, comprising a crank rigidly carried by the outer end portion of each of said studs, and a link articulated to said crank and to a part rigid with said lamps, so that upon rotative movement

of said lamp carrying means with respect to said carrier, there will be a relative rotation of each said crank and said lamps respectively such as to cause a tilting of the lamps, the entire construction being arranged so as to enable said lampchanging apparatus to accommodate itself to the use of lamps of such large size that tilting thereof is necessary to permit carrier rotation and lamp interchange without interference of the parts in their movements incident thereto.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
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