This invention relates to a lamp changing mechanism and more particularly to a mechanism for removing a heated lamp from its operating station in a piece of apparatus thereby to facilitate manual replacement of the lamp without danger of injury to the operator.

Although apparatus made in accordance with this invention is of general utility, it is particularly advantageous for use in a class of photographic projectors known as overhead projectors. Such projectors are designed primarily for use by a teacher or lecturer at the front of a room and they are arranged to project a picture over his head onto a vertical screen disposed at the front of the room, thereby permitting the teacher or lecturer to face the class while the latter faces the screen. Briefly, an overhead projector comprises a projection head slidably carried by a vertical post extending from the projector housing. Such housing carries the projection lamp and the necessarily associated components of the optical system.

The projection lamp is positioned proximate to the bottom of the housing and is removably carried by suitable socket members which serve to connect the lamp into an electrical circuit as well as to properly position the lamp in the optical system of the projector. Projection lamps operate at relatively high temperatures and this is particularly true in the case of a tungsten iodine lamp generally used in projectors of this class. Consequently, the lamp burn out during actual use of the projector, it cannot immediately be replaced without danger of the operator burning his fingers. Alternatively, the lecture must be interrupted for a period of time sufficient to permit the lamp to cool down to a safe handling temperature.

An object of this invention is the provision of a simple mechanism for removing a heated lamp from its operating station in a piece of apparatus thereby facilitating manual replacement of the lamp.

An object of this invention is the provision of a mechanism for use with a lamp carried by socket members supporting the lamp and connecting it into an electrical circuit, said mechanism effecting a release of the lamp from the socket members and displacing it to a position removed from its normal operating station.

An object of this invention is the provision of a socket assembly for supporting a lamp in a normal operating station, which assembly includes a mechanism operable to free the lamp from the socket assembly, transport the lamp to a point removed from the operating station, and to re-establish operative relationship with the socket assembly and a replacement lamp.

An object of this invention is the provision of a simple mechanism for use with a lamp supported in an operating station by socket members and connected in an electrical circuit, said mechanism being manually operable to disconnect the lamp from the electrical circuit, support the lamp as it is mechanically disconnected from the socket members, and transport the lamp to a point remote from the operating station.

These and other objects and advantages of the invention will become apparent from the following description when taken with the accompanying drawings. It will be understood, however, that the drawings are for purposes of illustration and are not to be construed as defining the scope or limits of the invention, reference being had for the latter purpose to the claims appended hereto.

In the drawings wherein like reference characters denote like parts in the several views:

FIGURE 1 is a top plan view of apparatus made in accordance with this invention;

FIGURE 2 is a front, elevational view of the apparatus, with the latching plate removed for clarity of disclosure;

FIGURE 3 is a side elevational view of the apparatus, with the receptacle omitted;

FIGURE 4 is a fragmentary, isometric view showing the lamp-supporting fingers of the apparatus; and

FIGURE 5 is a fragmentary, front elevational view to show the arrangement for latching the operating lever in the down position.

Referring now to the drawings, there is shown a lamp 10 supported in an operating station, by a pair of sockets, or terminal members 11 and 12, in spaced relationship to a base 13. Those skilled in this art will understand that the base 13 may constitute the bottom of an overhead projector housing and that the lamp is positioned along the geometric axis of the optical system. Further, a suitable reflector, not shown, would be disposed below the lamp for directing the light beam upwardly through a Fresnal lens and a horizontal projection stage.

The illustrated lamp is a conventional tungsten iodine lamp designed for operation in the horizontal position. Such lamp has a central, tubular portion 14, carrying the filament, and flattened end portions 15 and 16 carrying ceramic tubes 17 and 18, respectively. These ceramic tubes encircle the lamp terminals which are connected to the lamp filament. The socket members 11 and 12, made of insulating material such as, for example, ceramic, are provided with semi-circular grooves (for loosely accommodating the tubular ends of the lamp) and fixed contact pins 19 and 20 which engage the lamp terminals when the socket members are in the normal, illustrated positions. It may here be pointed out that the lamp terminals include concave outer surfaces, whereby the pins 19 and 20, of the socket members, serve to properly position the lamp along a predetermined axis as well as to connect the lamp into an electrical circuit.

Referring specifically to the socket member 12, this member is secured to the base of a metal bracket 22 having parallel, spaced arms 23, 24. A U-shaped, metal bracket 25 has a base portion secured to the base 13 (as by the screws 26) and upstanding arms 27, 28 extending along the arms of the bracket 22. Adjacently disposed arms 23 and 27 are pivotally secured together by a rivet 29, whereas the similarly disposed arms 24 and 28 are pivotally secured together by a shaft 30, which shaft carries the coiled section of a spring 31, said spring having one end looped over the upper edge of a flat rod 32. Such rod has an offset, central portion secured to the upstanding base portion of the bracket 22 (as by spot welding) and a forward end portion secured to the operating lever 33. The other end of the spring 31 abuts against the lower edge of the offset central portion of the rod 32.

This spring is pre-tensioned in a direction such that it biases the flat rod 32 and operating lever 33 in a direction such that the lever normally is in the raised position.

From the description given to this point, it is apparent that pressing the operating lever 33 downwardly, toward the base 13, effects angular rotation of the lever about the shaft 30 and simultaneously rotates the bracket 22 in a direction such that the socket member 12 is pivoted outwardly of the ceramic lamp end 17.

The associated socket member 11 similarly is secured to a bracket 22' which is pivotally supported by the U-shaped bracket 25'. A linkage member, comprising an
L-shaped, flat rod 35, has one end secured to the unstanding base portion of the bracket 25' and the other end pivotally coupled to the proximate end of the flat rod 32 by a double-headed pin 36. Thus, rotation of the operating lever 33 toward the base 13, that is, in a counterclockwise direction about the shaft 30, as viewed in FIGURE 3, results in a counterclockwise rotation of the flat rod 33 about the shaft 30 and a simultaneous clockwise rotation of the flat rod 35 about the shaft 30'. Thus, both of the socket members 11 and 12 pivot outwardly of each other, thereby to free the lamp 10, upon a predetermined downward displacement of the operating lever.

A U-shaped, metal bracket 38, having a base portion secured to the base 13, as by the screws 39, has integral upstanding arms 40, 41 provided with aligned holes receiving the shaft 42. Normally disposed beneath the lamp is a lamp-supporting member comprising the spaced, parallel fingers 44, 45 integrally joined to a base portion 46. The shaft 42 passes through aligned clearance holes formed in the spaced fingers 44, 45 of the lamp-supporting member and carries a coil spring 47 which loads such member in the down position.

As best shown in FIGURE 5, to which reference now is made, aligned rectangular grooves 49 and 50 are formed at the free ends of the fingers 44 and 45, respectively. The flattened end portions 35 and 16, of the lamp 10, are received in these grooves when the lamp is disengaged from the socket members, as will be described hereinafter. The shaft 42 also passes through a clearance hole formed in an actuating finger 51, said finger 51 having an offset end secured, as by welding to the base portion 46 joining the fingers 44 and 45. The free end, of the actuating finger 51, is positioned above, and extends beyond, the overlapped end portions of the flat rods 32 and 35, see FIGURES 1 and 2.

As shown in the drawings, the operating lever 33 is in the normal, or first position, in such position of the operating lever, the socket members 11 and 12 are biased toward each other, by the respective coiled springs 31' and 31, whereby the lamp is firmly retained in the operating station and connected into the electrical circuit through the contact pins 19 and 20 and the respective flexible cables 54 and 55 connected thereto. As the operating lever is pressed downwardly, the socket members are rotated away from each other and will become disengaged from the lamp when the operating lever has been depressed a predetermined angular extent. Continued depression of the operating lever brings the overlapping portions of the flat plates 32 and 35 in contact with the overlying actuating finger 51. At this point, the lamp is free of the socket members and is supported in the rectangular grooves formed at the ends of the fingers 44 and 45. Further depression of the operating lever rotates the fingers 44 and 45 about the shaft 42, thereby transporting the lamp to the dotted-line position shown in FIGURE 2, after which further depression of the operating lever results in the lamp falling into a suitable receptacle 52.

The operating lever may be latched in the depressed, or second position, by means of a ratchet plate 53, secured in place on the base 13 by the screws 54. As best seen in FIGURE 5 (which is a fragmentary front elevation view), the upstanding side edge of the ratchet plate 53 comprises a sloping portion 56 terminating in a lip 55. As the operating lever is depressed, it will first engage and then slide along the sloping portion 56, after which the upper side edge of the lever may be pressed under the lip 55, thereby retaining the lever substantially in its second position. This permits the operator to place a new lamp properly into position on the fingers of the lamp-supporting member. While holding the new lamp in this position with one hand, the other hand is used to free the operating lever from its latched position and permit it to return to its original position. During the return movement of the operating lever, the new lamp is transported to the position illustrated in FIGURE 1, after which the socket members automatically return to the illustrated, normal positions. The coiled springs 31 and 31' provide a biasing force to return the mechanism to its original position and also press the socket members into firm axial engagement with the lamp ends, thereby assuring proper connection of the lamp in the electrical circuit. Since the flattened rectangular portions of the new lamp are positioned within the corresponding rectangular grooves formed in the lamp-supporting fingers 44 and 45, the lamp filament is properly oriented in the optical system, that is, with the flattened portions of the lamp parallel to the base 13.

In the case of an overhead photographic projector, the cover plate of the projector housing acts as a safety switch inserted in the electric power line. Such switch disconnects the power line from the rest of the components as the cover is rotated to the open position to afford access to the lamp or other components, thereby eliminating an electrical shock hazard. In other applications, a safety switch, such as a micro-switch, may be actuated to the open position upon initial movement of the operating lever, of the mechanism described herein.

Having now described our invention, those skilled in the art will be able to make various changes and modifications in the illustrated construction and assembly of the parts, without thereby departing from the scope and spirit of the invention as recited in the following claims.

We claim:
1. In combination,
   (a) a double-ended lamp,
   (b) a pair of movable socket members,
   (c) spring means normally biasing the socket members into engagement with the ends of the lamp to support the lamp in an operating station,
   (d) a pair of linkage members connected to the socket members,
   (e) means connecting together the linkage members for pivotal movement about an axis normal to that of the lamp,
   (f) a lamp-support member normally spaced from the lamp,
   (g) means mounting the lamp-support member for engagement by one of the linkage members,
   (h) an operating lever connected to one of the linkage members, movement of said lever resulting in pivotal movement of the linkage members about said axis,
   the recited arrangement being such that pivotal movement of the linkage members results in the simultaneous movement of the socket members out of engagement with the lamp and movement of the lamp-support member into engagement with the lamp.
2. The invention as recited in claim 1, wherein the lamp has flattened end portions of generally rectangular cross-section, and wherein the said lamp-support member includes means for receiving said flattened end portions when the lamp-support member is moved into engagement with the lamp.
3. The invention as recited in claim 1, including latching means securing the said operating lever in a predetermined position.
4. In combination,
   (a) a horizontally-disposed lamp,
   (b) a pair of spaced socket members for supporting the lamp in an operating station,
   (c) means mounting said socket members for rotation about parallel axes normal to the axis of the lamp,
   (d) an operating lever secured to one socket member and mounted for rotation about the axis thereof from a first to a second position,
   (e) a linkage member secured to the other socket member and mounted for rotation about the axis thereof, said linkage member being pivotally coupled.
to said lever at a point intermediate of the socket members,

(f) spring means normally biasing the socket members toward each other thereby to support the lamp in the operating station,

(g) a pair of spaced arms extending between the socket members and mounted for rotation about an axis parallel to the lamp axis, said arms having ends disposed beneath the lamp and provided with aligned grooves for receiving the lamp,

(h) an actuating finger secured to the said arms and adapted for engagement by the lever as it rotates from the first to the second position, and

(i) means latching the lever substantially in the second position,

the arrangement being such that rotation of the lever from the first to the second position results in rotation of the socket members to disengage the lamp, rotation of the said arms to support the lamp in said grooves when the lamp is disengaged from the socket members, and continued rotation of said arms to transport the lamp to a point removed from said operating station.

References Cited by the Examiner

UNITED STATES PATENTS

3,157,088 11/1964 Zillmer ................ 88—24

NORTON ANSHER, Primary Examiner.

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