

[54] **REFLECTOR FOR INCANDESCENT LAMP**

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Related U.S. Application Data

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[51] Int. Cl. **F21s 1/12**, F21s 3/10

[58] Field of Search 240/81 R, 81 LD, 240/81 C, 103 R, 108 R, 41.37

[56] **References Cited**

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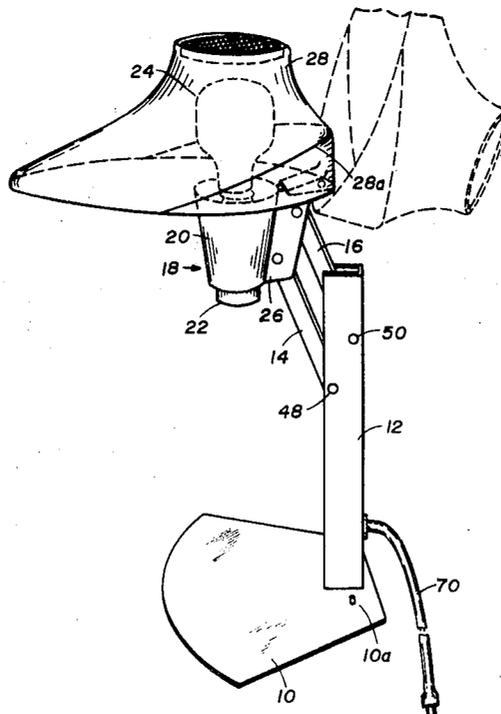
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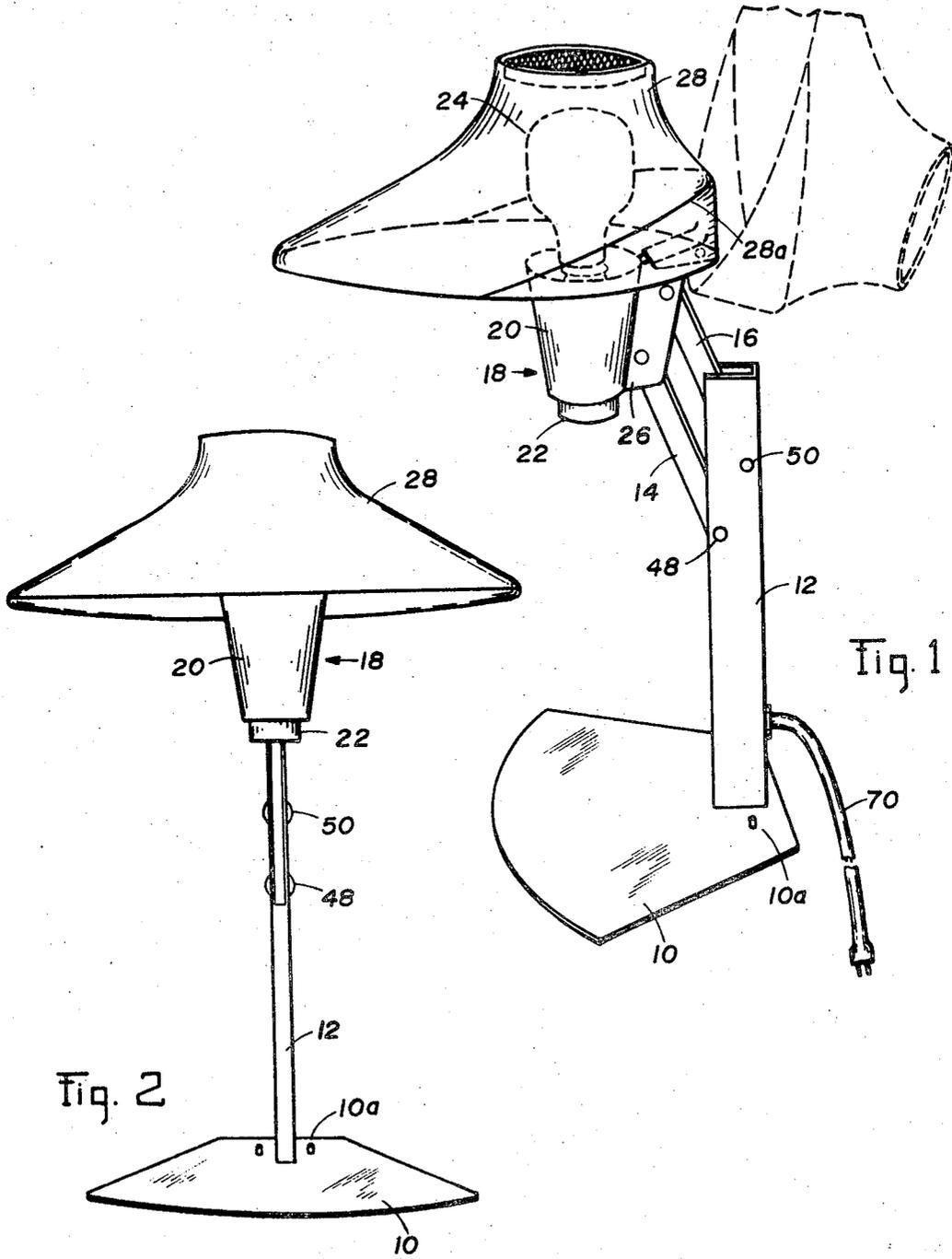
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[57] **ABSTRACT**

A desk lamp having an upright columnar member secured at one end to a base and on which a pair of parallel arms for supporting an incandescent light bulb housing and reflector are pivotally mounted. The combined weight of the lamp, reflector and supporting arms is counterbalanced by a spring contained within the column, and the parallel arms permit vertical adjustment of the lamp over a range of heights. The socket for the bulb is contained within a cup which also houses a dimmer circuit, the control for which depends from the bottom of the cup. A reflector secured to the cup is shaped and positioned relative to the bulb so as to intercept and deflect light downwardly and forwardly over a generally semi-circular area in front of the base. The combination of vertical adjustability, light intensity control and reflector shape provides a wide range of light intensity over a working zone of adjustable area.

3 Claims, 11 Drawing Figures





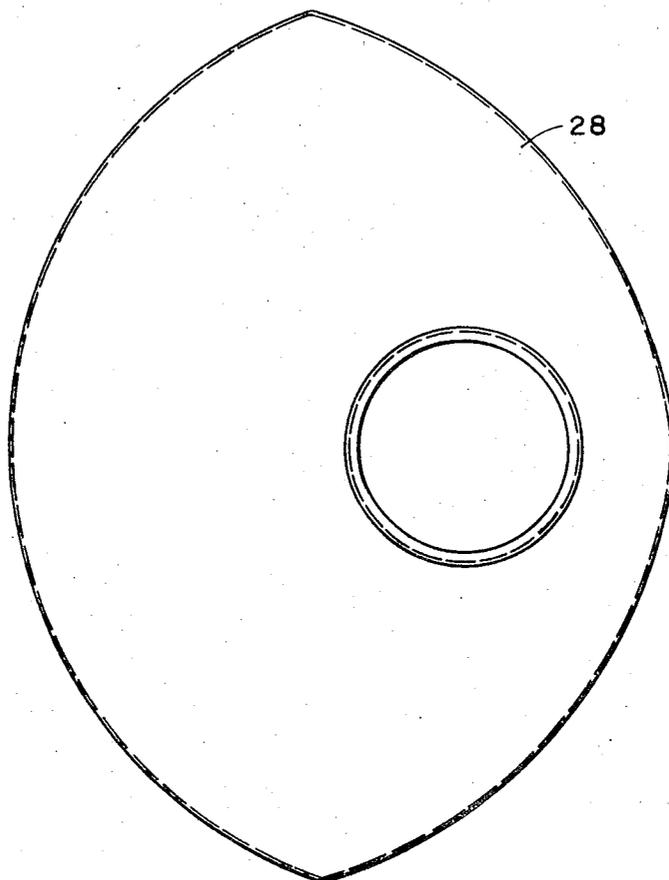


Fig. 3

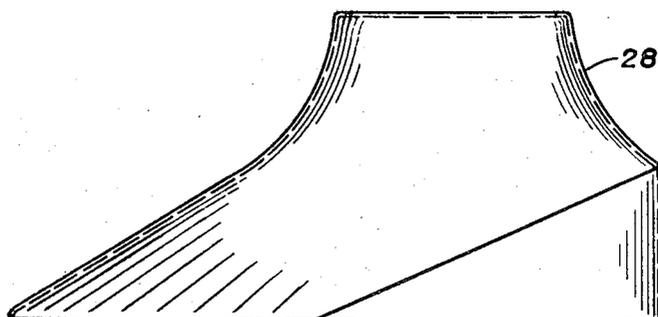


Fig. 4

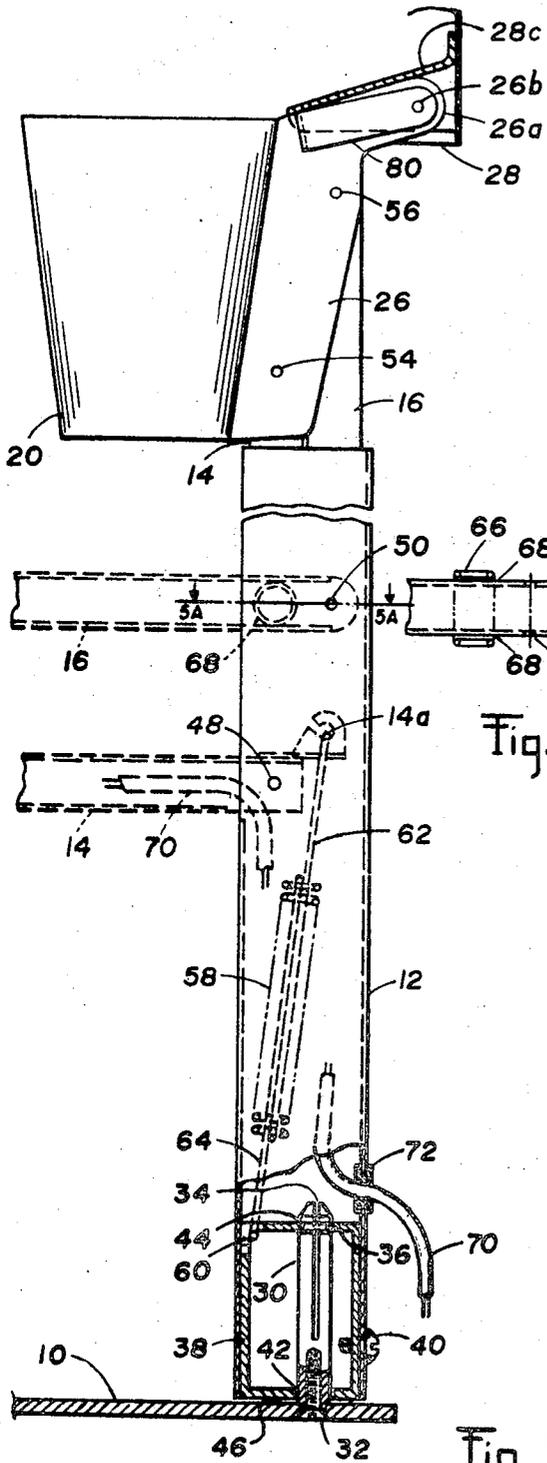


Fig. 5A

Fig. 5

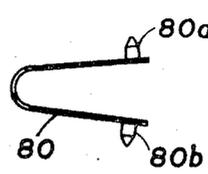


Fig. 5B

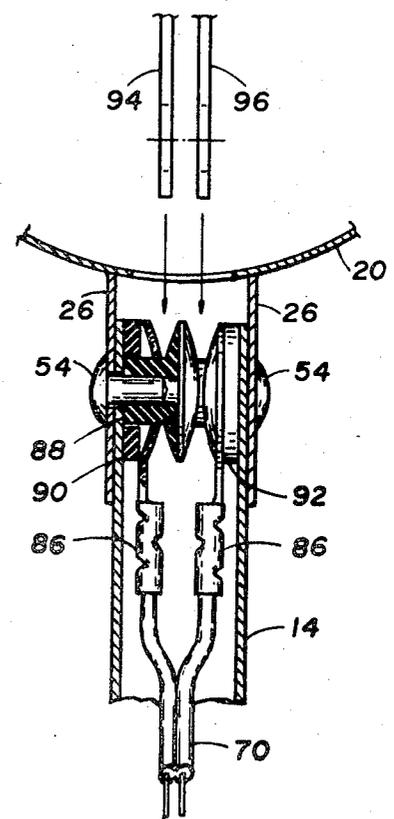


Fig. 7

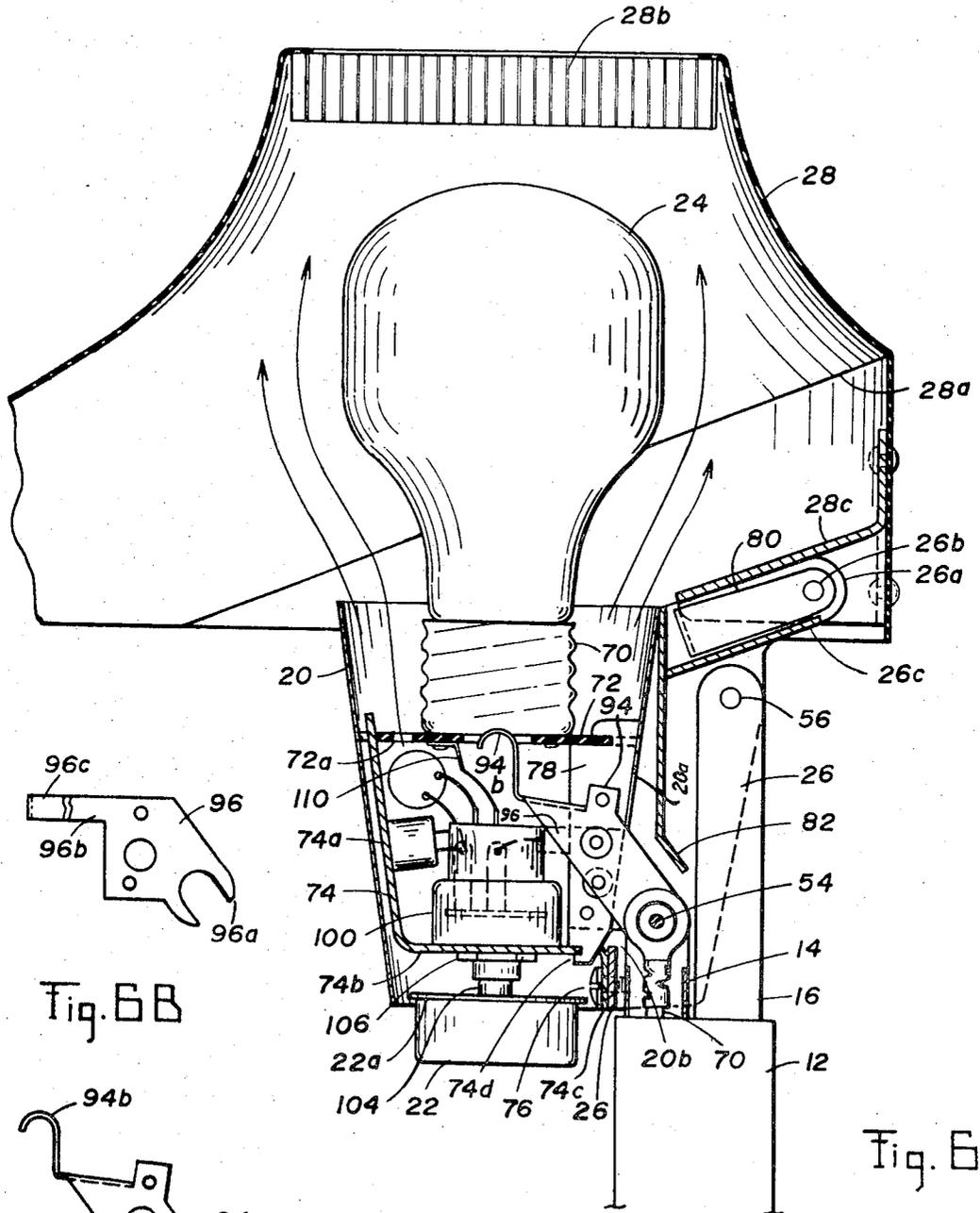


Fig. 6B

Fig. 6A

Fig. 6

REFLECTOR FOR INCANDESCENT LAMP

This is a division of application Ser. No. 81,081, filed Oct. 15, 1970.

BACKGROUND OF THE INVENTION

This invention relates to lamp assemblies of the type including an incandescent bulb and associated light reflector and a support therefor for producing a light pattern over a work area, and more particularly to a lamp for producing a light pattern of predetermined shape and of adjustable size and intensity. The invention will be described as embodied in a desk lamp, but its features are readily applicable to other forms of light fixtures.

Light for desk work is generally provided by a lamp supported or suspended at approximately eye level, and which is placed to one side and to the front of the person seated at the desk. Known desk lamps generally consist of an incandescent lamp surrounded by a diffusing globe or shade, which may or may not be open at the top and bottom. The diffusing shade spreads the light in all directions, and while this results in illuminating the area surrounding the luminaire, it has the disadvantage of often providing insufficient light over the entire work area. Lamps of this type are usually of fixed height so as to illuminate a fixed area at a fixed brightness level, and being at approximately eye level cause undesirable harmful glare in spite of careful design of the diffuser or shade.

With some types of desk work it may be desirable to brightly illuminate a relatively small area, and for other work it may be necessary to illuminate a larger area at the same or different, but yet sufficient intensity. In order to provide sufficient light over a range of sizes of work area from a bulb of given wattage, it is essential that a maximum amount of the available light be directed onto the work area of the desk. This objective is partially solved by a refractor tilted toward the work area in the lamp disclosed in Wince Pat. No. 3,413,461, but with this construction the size of the work area and the intensity of the illumination are fixed.

The wide variety of so-called "high intensity" lamps marketed in recent years are adjustable in height so as to change the size of the work area they illuminate, as well as the intensity of the light on the work area, but with this type of adjustability the center of the circular area illuminated shifts in position relative to the base upon vertical adjustment, and, of course, such lamps provide little surround lighting.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a lamp which efficiently utilizes the light available from a standard incandescent bulb by directing most of it onto the work area while still providing sufficient light to illuminate the surrounding area.

Another object is to provide a lamp which directs light primarily over the work area for optimum utilization of available light, and which is vertically adjustable to vary the size of the illuminated area.

Still another object of the invention is to provide a lamp having in addition to the foregoing features the capability of adjusting the intensity of the light delivered by the bulb.

Still another object of the invention is to provide a lamp assembly adapted for combination with a separable base to form a free-standing desk lamp, or to be at-

tached to a wall or other vertical support to provide an adjustable wall or floor lamp.

Another important object of the invention is to provide a lamp having the foregoing features which is compact, attractive, and relatively simple and inexpensive to manufacture.

Briefly, the foregoing objects are achieved by an assembly consisting essentially of a hollow upright columnar member adapted to be secured at one end to a base and on which a pair of parallel arms for supporting a bulb and socket and reflector assembly are pivotally mounted. The reflector is readily detachable from the bulb and socket sub-assembly, and the upright member is easily attached to the base, thereby allowing the lamp to be shipped in a relatively small and compact package as three separate sub-assemblies. The means for securing the reflector to the bulb and socket subassembly, and the upright member to the base, are sufficiently simple that they can be assembled, without tools, by the customer. The combined weight of the bulb and reflector assembly and the supporting arms is counterbalanced by a spring contained within the hollow upright member, whereby the lamp and reflector remain in the vertical position to which it is adjusted.

The socket for the bulb, which is of the base-down type, is contained within a cup which also houses a dimmer circuit, the control for which projects from the bottom of the cup for convenient access. A reflector, a portion of which has a parabolic contour, is pivotally secured to the cup for ease in changing the bulb. The reflector is otherwise shaped and positioned with respect to the bulb to intercept and deflect light downwardly and forwardly over a generally semi-circular area in front of the base thereby to efficiently use the available light. Electrical connection is made to the lamp and dimmer circuit through rotatably slidable contacts to eliminate bending of the electric cord as the vertical position of the lamp is adjusted. The combination of vertical adjustability (over a range of from 8 inches to 16 inches above the tabletop in the preferred embodiment), light intensity control, and reflector shape provides a wide range of light intensity over a working zone of adjustable area.

DESCRIPTION OF THE DRAWINGS

Other features of the invention, and a better understanding of its construction and operation will be had from the following detailed description, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating the general appearance of the lamp assembly in accordance with the invention;

FIG. 2 is a pictorial front elevation view of the lamp with the bulb and reflector in its uppermost position;

FIG. 3 is a top plan view of the reflector;

FIG. 4 is a side elevation view of the reflector;

FIG. 5 is a side elevation view, partially in section, of the vertical supporting column of the lamp assembly;

FIG. 5A is a fragmentary cross-sectional view of the inner end of one of the supporting arms for the bulb and reflector assembly, taken along line 5A—5A of FIG. 5;

FIG. 5B is a top view of means for detachably securing the reflector to the socket and bulb sub-assembly;

FIG. 6 is an elevation cross-sectional view of the socket and bulb sub-assembly taken along a diameter of the socket-enclosing cup;

FIGS. 6A and 6B are plan views of connecting elements through which electrical connection is made to the lamp; and

FIG. 7 is a cross-sectional view, greatly enlarged, illustrating the manner in which electrical connection is made to the lamp.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, which illustrates the invention embodied in a desk lamp, the lamp is supported on a base consisting of a flat plate 10 of generally trapezoidal shape, curved at its front edge for aesthetic purposes and to provide stability to the assembly, particularly when the lamp holder and reflector assembly are in the lowermost position. Although the size, shape and material of base 10 is subject to a variety of choices, (provided, of course, that it is sufficiently heavy and shaped to stably support the lamp) in the preferred embodiment the base is formed of $\frac{1}{8}$ inch steel plate approximately 4 inches wide at the rear edge, approximately $9\frac{1}{2}$ inches wide at its widest point and having an overall front-to-back dimension of about 7 inches. This construction provides a sturdy support for the lamp assembly, causes very little interference to the work area in front of the lamp, and requires a minimum of space for packaging.

The lamp socket and reflector are adjustably supported on an upright tubular member 12, preferably of rectangular cross-section as shown, which is designed for easy but secure attachment at its lower end to the base 10 (by means to be described). The hollow column 12 is closed on all four sides for slightly more than half its height, the remainder of the height having an open front wall to accommodate a pair of arms 14 and 16 for supporting a lamp assembly 18. In a typical desk lamp the column 12 is approximately 12 inches tall, with the open front wall thereof extending down approximately 5 inches from the upper end. The arms 14 and 16 are pivotally supported between the side walls of the column, and extend through the open front wall to allow vertical adjustability of the lamp and reflector sub-assembly.

The lamp assembly 18 includes a socket and dimmer control circuitry contained within a conical cup 20 from the lower end of which extends a combined on-off switch and control knob 22. A standard base-down incandescent bulb 24 is threaded into the socket and projects upwardly from the open upper end of cup 20. The outer ends of arms 14 and 16 are pivotally attached to a U-shaped bracket 26 extending radially from the cup and forming an integral part of the lamp sub-assembly.

An important feature of the lamp which contributes to the efficient utilization of the light available from bulb 24 is the reflector 28, particularly its shape, its position relative to the bulb, and the manner in which it is secured to the lamp sub-assembly. As best seen in FIGS. 3 and 4, the reflector is made of opaque material, such as metal, although for ease of manufacture, weight reduction and improvement in appearance, it is preferably formed of a suitable plastic material and is provided with a highly reflective inside surface. The reflector is generally conical in shape, having a relatively small diameter at its upper end and flaring downwardly and rather sharply outwardly toward its lower edge. In a preferred embodiment the smaller diameter is $3\frac{1}{2}$

inches, the larger diameter (if not modified in the manner shown and to be described) is approximately 13 inches, and the overall height is $4\frac{1}{2}$ inches.

The shape departs from conical in the respect that at the rear (as related to the base 10) the flare is interrupted at line 28a, with the surface below line 28a being essentially perpendicular to the plane defined by the lower edge. This vertically-oriented surface at its highest point is approximately one-half the overall height of the reflector and intersects and smoothly blends into the flared conical surface along the plane defined by line 28a, which plane intersects the plane defined by the lower edge slightly forwardly of the vertical center line of the otherwise conical reflector. The angle of incline of the plane defined by line 28a is so related to the curvature of the flared conical reflector that the curvature of the interior of the vertically-oriented surface is essentially parabolic.

The reflector 28 is secured to the lamp and housing sub-assembly (by means to be described) with its vertical center-line coincident with the center line of bulb 24, and is so dimensioned that the center-line of the bulb falls essentially at the focus of the parabolic surface. Accordingly, the parabolic surface intercepts light rays from the bulb over an arc of approximately 180° and redirects them forwardly—in the same direction as the rays directly emitted from the "front" area of the bulb—and thence downwardly onto the work zone from the conical portion of the reflector, for maximum eye protection and light concentration on the area of the work surface forwardly of the base. The parabolic surface, coacting with the conical surface, achieves an evenly dispersed light intensity, substantially all directed over a generally semi-circular working zone forwardly of the base, and of greater brightness, for a bulb of given wattage, than is obtainable with prior art luminaires known to applicant.

The reflector is detachably and pivotally secured at a single point at the upper end of the U-shaped bracket 26 by a mounting bracket extending inwardly from its vertically-oriented surface, the details of which will be more evident later from the description of FIGS. 3 and 4. Suffice it here to note that the pivotal attachment permits the reflector to be tipped up to the position shown in dotted lines in FIG. 1 for easy access for bulb replacement without detachment of the reflector from the luminaire, or to enable the lamp to be used for full room illumination, while at the same time being easily attached and detached to permit it to be packaged unassembled—for economy of packaging—for assembly by the customer.

From the description thus far, it has been seen that the desk lamp embodiment of the invention comprises three major separable parts: a base, a supporting column and bulb and socket assembly, and a reflector. The base and column together require relatively little packing space, with the result that a carton only slightly larger than necessary to contain the reflector is required for shipment of the complete lamp. It will be evident, too, that since the column is detachable from the base, it is adapted to be otherwise supported, as by securing it with a suitable fastening means to a wall, or to a suitable self-supporting standard to fashion a floor lamp.

Turning now to FIG. 5, the details of construction of the column 12 will be described. As was noted earlier, column 12 is adapted to be secured at its lower end to

the base 10. This is accomplished in the preferred embodiment by an upstanding post 30 secured to the base near the rear edge thereof by a screw 32 threaded into a central opening in its lower end. The post is slotted for about half its length, for example, by saw-cuts at 90° to each other, one of which is visible at 34, to give it springiness, and is provided with a circumferential groove 36 near its upper end. The post would normally be factory-assembled with the base 10. The column 12 is secured to the post by coaction therewith of a box-like swivel and lock member 38, which may be formed of a suitable metal such as aluminum, zinc or steel, or of nylon, dimensioned to fit snugly within the lower end of the column and secured therein by a single screw 40. The bottom wall of member 38 has an opening 42 therein of a diameter to snugly fit the post, and the upper wall has an aligned opening 44 of a diameter equal to the diameter of the bottom of the groove 36 in the post so as to compress the upper end of the post and firmly engage the groove as the column is pressed down over the post. The groove preferably has square sides to make difficult the removal of the column, once assembled, but should the customer find it desirable or necessary to remove the base, he can do so by removing either of screws 32 or 40. The important point is that the customer can securely assemble the column to the base—without tools—simply by pushing the column down over the post. This mode of attachment has the further virtue of allowing the column to be rotated about the post, relative to the base, through an angle of 180°–90° to either side of the normal position shown in FIG. 1; the shape, dimensions and weight of the base described earlier allows this to be done without affecting the stability of the lamp, even when the luminaire is in its lowermost position. To facilitate such rotation, a spring washer 46 is placed between member 38 and base 10, and a pair of stops, one of which is visible at 10a in FIG. 1, are provided on the base to limit the rotation to 180°.

As was noted earlier, the arms 14 and 16 are pivotally supported between the sidewalls of column 12 and extend through the open front wall to allow vertical adjustability of the luminaire assembly. More specifically, arm 16, of the same length as arm 14, is pivoted at a point 50 above and to the rear of pivot point 48 with its inner end extending toward the rear wall of the column. It will be observed that with this location of the pivot points, the arms may be moved parallel to each other and when in their vertical position (the uppermost position of the lamp and reflector assembly) they are contained within column 12, one behind the other, to give the general appearance of being a vertical extension of the column, as shown in FIG. 2.

Arms 14 and 16 are hollow, and preferably of square cross-section, having an outside dimension corresponding to the width between the inner surfaces of the sidewalls of column 12 so as to be given lateral stability by the sidewalls. The outer ends of arms 14 and 16 are pivotally secured to the U-shaped bracket 26 of the lamp assembly at points 54 and 56, respectively, located in the same relative position to each other as pivot points 48 and 50, whereby the arms are kept parallel to each other as the height of the lamp assembly is adjusted by pivoting them about points 48 and 50.

The weight of the lamp and reflector assembly, and of arms 14 and 16, is counterbalanced by a compression spring 58 mounted inside the column and attached

to a hook 60 formed on member 38 and at the other end to a hook 14a formed on the inner end of arm 14. The spring is attached to hook 14a by a loop of wire 62 of hairpin shape, the free ends of which extend through the spring 58 and are hooked over its lowermost convolution, and attachment is made to the hook on the swivel member by a similar hairpin-shaped wire 64, the free ends of which engage the uppermost convolution of spring 58. The attaching wires 62 and 64 and the spring itself are so dimensioned that when the arms 14 and 16 are in their vertical position the spring 58 is subjected to little or no compression, whereas when the luminaire is adjusted to a lower position the spring is increasingly compressed. The spring has a modulus to maintain the lamp assembly at any height to which it may be adjusted between a position where arms 14 and 16 are substantially parallel to the base 10 (at which the moment of force causing compression of spring 58 is greatest) to a position where the arms 14 and 16 are vertical.

For greater lateral stability, and to help insure that the lamp assembly stays at the height to which it is adjusted, arm 16 is provided with a brake which frictionally engages the inner surfaces of the sidewalls of column 12. As shown in the fragmentary sectional view of FIG. 5A, the brake consists of a compression spring 66 with flattened ends mounted within the hollow arm at a point outwardly from pivot point 50 and arranged to exert force outwardly through circular openings 68 in the sidewalls of arm 16. When assembled within column 12, the flat ends of the spring press against the inner walls of the column to provide a controlled amount of friction between the arm and the column to brake the lamp assembly at the position to which it is adjusted.

The lamp cord 70 through which the bulb is energized is brought through a suitable grommet 72 secured in an opening in the rear wall of the column 12 near its lower end. The cord extends upwardly within the column (there being ample clearance between the walls and spring 58) and into the inner end of hollow arm 14, past pivot point 48, and to pivot point 54 where its two conductors are respectively connected to the "hot" and grounded sides of the lamp circuit through a novel rotatable contact assembly (to be described in greater detail below). Thus, the cord is completely concealed within the assembly and is subjected to only limited bending at the point of entry into arm 14 as the height of the lamp is adjusted.

The socket for the single incandescent bulb, and dimmer control circuitry therefor, are housed in the conical cup-shaped member 20 to which the U-shaped bracket 26 mentioned earlier is secured, as by spot welding or being formed integrally therewith by casting or molding. As best seen in FIG. 6, the socket 70 for the lamp 24 is supported on a circular disc 72 formed of insulating material in which there is a central opening to provide access to the hot terminal of the filament of the lamp, and a series of vent holes near the outer periphery. The insulating disc 72 is retained in position within the cup by a Z-shaped bracket 74 formed of flat metal strip stock shaped to have a first segment 74a disposed generally parallel to the front wall of cup 20, a second segment 74b disposed parallel to disc 72 and the bottom of the cup, and a third portion 74c which depends from portion 74b and in which there is an opening to receive a screw 76 for securing the bracket to a

threaded hole in cup 20. The upper free end of portion 74a is received by and secured in a notch in the periphery of disc 72. Diametrically opposite from the point of attachment of the bracket to the disc, the latter is notched to receive a complementary notch in a strip 78 of insulating material which is disposed generally parallel to the wall of the cup, in contact therewith at its upper end, and extending through an opening 74d in bracket 74 at its lower end.

The cup 20 has a generally rectangular opening in the rear wall, generally straddling the strip 78 and extending from point 20a to point 20b. The sidewalls of U-shaped bracket 26 are spaced apart by the width of the opening and extend radially from the periphery of cup 20. Extending from the upper end of bracket 26, as an integral part thereof, are a pair upwardly extending extensions or ears, one of which is shown at 26a, having openings 26b for receiving a suitable fastener 80 for detachably, and pivotally, securing the reflector 28 to the lamp socket assembly. To give the extension 26a greater rigidity and to preclude entry of foreign objects into the open upper end of column 12, especially the region at which electrical connection is made to the lamp circuitry, the space between the two walls of the extension is closed by a septum 26c. This septum is joined at its inner end to a flat strip 82 which lies between and is joined to the sidewalls of U-shaped bracket 26 and extends downwardly and rearwardly from the upper rim of cup 20, terminating at a point just above pivot point 54. The flat strip 82, together with the sidewalls of bracket 26, and arms 14 and 16 prevent access to the rotatable sliding connection of the cord 50 to the lamp circuit at pivot point 54.

Referring now to FIG. 7, electrical connection between the lamp cord 70 and the bulb and dimmer circuitry is made through a rotatable sliding contact arrangement at pivot point 54, namely, the point at which the outer end of arm 14 is attached to U-shaped bracket 26. The two conductors of cord 70 each have a lug 86 crimped to the end thereof, the lugs being cup-shaped as shown and having a circular opening sufficiently large to receive an insulating bobbin 88 which encloses rivet 54. The conductor that is to be connected to the grounded side of the lamp circuit is insulated from arm 14 (which may be made of either metal or an insulating material, such as plastic) and from rivet 54 by bobbin 88, formed from Teflon, for example, and by an annular washer 90, also formed of Teflon and having an inner diameter to fit over bobbin 88. Washer 90 is disposed between the lug 86 and the inner surface of one wall of arm 14. The bobbin and a second washer 92 similarly support the lug on the other conductor and insulates it from the inner surface of the opposite side wall of arm 14. It will be seen that this construction provides electrical connection of the two conductors of the lamp cord to the separated pair of cup-shaped lugs which is unaffected by the pivoting of arm 14 relative to bracket 26 about the rivet 54. The two conductors are amply insulated from each other, from the sidewalls of bracket 26 and from other metallic portions of the lamp assembly and introduce no electrical hazard.

Electrical connection between the just-described cup-shaped contact and the lamp circuitry is made through a pair of connecting strips 94 and 96 secured, as by riveting, to opposite side of insulating strip 78. Connecting strip 94, the details of which are best seen in FIG. 6A, is formed from thin sheet metal and has a

U-shaped spade 94a at its downwardly extending end which is received between the central rim of bobbin 88 and the convex surface of the cup-shaped lug 86 on the hot conductor, and at its other end is provided with a spring contact 94b dimensioned and arranged to extend through the central opening in insulating disc 72 to firmly engage the central electrode of the bulb 24. The connecting strip 96, also formed from sheet metal and shown in detail in FIG. 6B, is positioned somewhat lower on strip 78 and has a shorter spade 96a which engages the cup-shaped lug on the other conductor and is held thereagainst by the central rim of the bobbin 88. The upper end 96b of the connector, which is formed with a tab 96c perpendicular to the plane of the drawing is connected directly (i.e., without other wiring) to one terminal 98 of a potentiometer 100, which includes an on-off switch controlled by knob 22. The shaft 104 of the potentiometer extends through an opening in the horizontal portion 74b of bracket 74 and is secured thereto by a nut 106. Electrical connection is made from the contacts of switch 100 to a soldering lug 110 mounted on the underside of insulating disc 72 which, in turn, is connected to the lamp socket 70. It will be noted that the on-off switch and dimmer control circuitry are all contained within the enclosure generally defined by bracket 74 and insulating disc 72 and that there is an absolute minimum of wiring in the lamp circuit. It will be seen, too, that the socket and lamp circuitry, being held within cup 20 only by screw 76, can be removed from the cup for repair or replacement simply by removal of the control knob and screw 76.

The diameter of the flange 22a on the inner end of control knob 22 is somewhat smaller than the diameter of the lower end of cup 20 so as to leave an annular clearance gap between the flange 22a and the cup for the intake of air for cooling the dimmer control circuitry and the incandescent bulb. The components contained in the cup are arranged to allow space for the flow of air therearound, which, together with the circumferentially-located apertures in disc 72 and a honeycomb diffuser 28b fitted in the top of reflector 28, creates a chimney effect causing air to flow upwardly over the dimmer, circuit and the bulb and out the top of the reflector, as indicated by the arrows. The diffuser 28b is preferably formed of aluminum honeycomb having $\frac{1}{8}$ in. hexagonal cells with walls 0.002 in. thick, and having an axial thickness of one-half in. The aluminum honeycomb promotes the dissipation of heat generated by the dimmer circuit and bulb in that it affords a large area for the transfer of heat from the moving air to the diffuser. Moreover, by using honeycomb having the indicated dimensions, unless one is directly over the reflector, he does not see the bulb; that is, the honeycomb effectively shields glare from the bulb, yet permits a certain amount of light to be directed upwardly from the reflector.

Finally, as best seen in FIGS. 5 and 6, the reflector 28 is pivotally secured to the upwardly extending ears 26a of the U-shaped bracket 26 by means of a reflector supporting bracket 28c secured, as by riveting, to the inner surface of the vertically-oriented parabolic surface of the reflector. The bracket 26c is bifurcated, the members thereof being spaced to be relatively snugly received between the upwardly extending ears of the U-shaped bracket. The members of bracket 28c have openings therein aligned with the openings 26b in ears 26a, the reflector bracket being joined to the ears by a

flexible U-shaped spring member **80** (FIG. 5B) having integral pins **80a** and **80b** which are inserted into the aligned openings. Thus, the reflector is pivotable about pins **80a** and **80b**, and may be removed from the lamp simply by squeezing the arms of spring **80** together to disengage the pins. The spring **80**, which may be formed of metal or plastic, is preferably factory-assembled in bracket **28c** so as to be conveniently accessible to the customer for attachment to the lamp.

I claim:

1. For use with a lamp assembly having a vertical incandescent lamp bulb mounted base down, a generally conical reflector having a circular top opening and having a first downwardly and outwardly flaring portion extending from the level of said top opening to a bottom opening lying in a plane parallel to said top opening, and having a second portion extending vertically upwardly from the plane of said bottom opening and smoothly joined to said first portion along an oblique plane which intersects the plane of said bottom opening and said flaring portion at a predetermined height above said bottom opening, the angle of incline of said oblique plane being so related to the curvature of said flared first portion that the curvature of said second portion is substantially parabolic.

2. Apparatus in accordance with claim 1 wherein said predetermined height is approximately one-half the

overall height of said reflector and said oblique plane intersects the plane of said bottom opening along a line displaced from the vertical center line of said first flaring portion in a direction and by an amount such that said second portion encompasses more than half the periphery of the said bottom opening.

3. For use with a lamp assembly having an incandescent lamp bulb mounted vertically base down, a generally conical reflector having a circular top opening and having a first downwardly and outwardly flaring portion extending from the level of said top opening to a bottom opening lying in a plane parallel to said top opening, and having a second position extending vertically upwardly from the plane of said bottom opening and smoothly joined to said first portion along an oblique plane which intersects the plane of said bottom opening and said flaring portion at a predetermined height above said bottom opening, the angle of incline of said oblique plane being so related to the curvature of said flared first portion that the curvature of said second portion is substantially parabolic, and a flat disc of honeycomb material supported in said top opening, the axes of the cells of said honeycomb material being substantially parallel to the vertical center line of said first flaring portion.

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