May 17, 1938. A. LEIPOLD ET AL 2,117,967

ELECTRIC HEAD LAMP

Filed Aug. 1, 1934

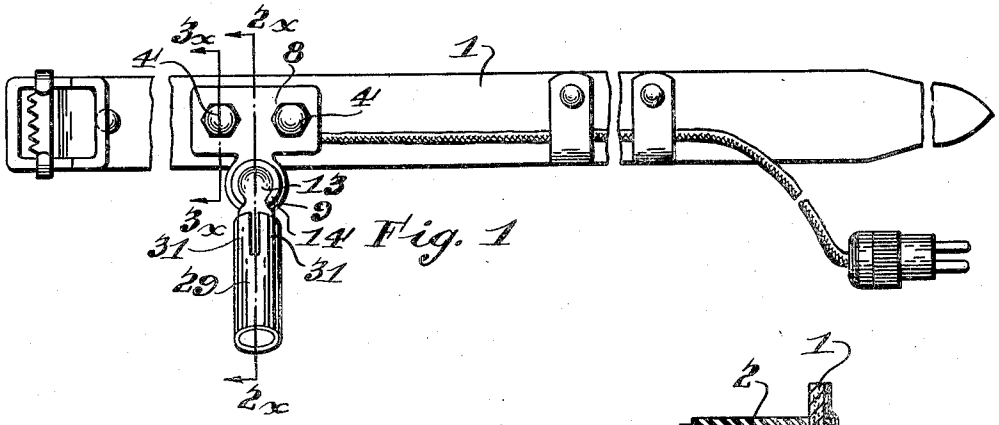


Fig. 1

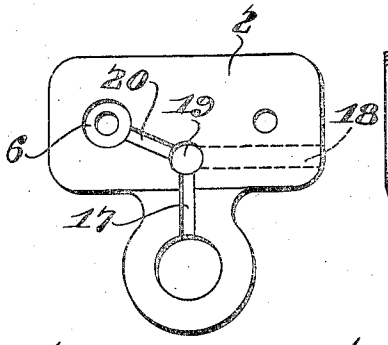


Fig. 4

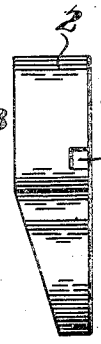


Fig. 5

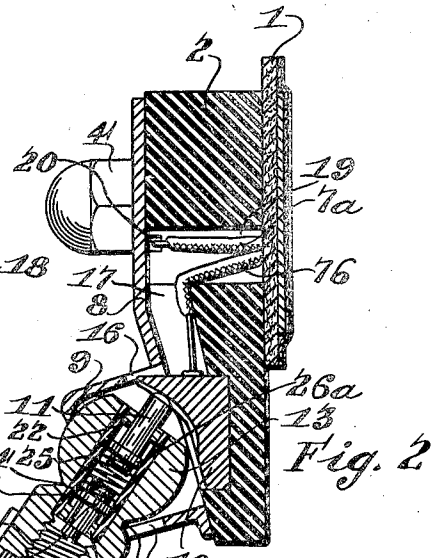


Fig. 2

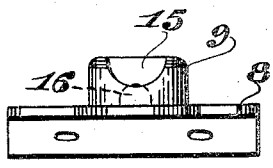


Fig. 6



Fig. 7

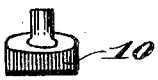


Fig. 8

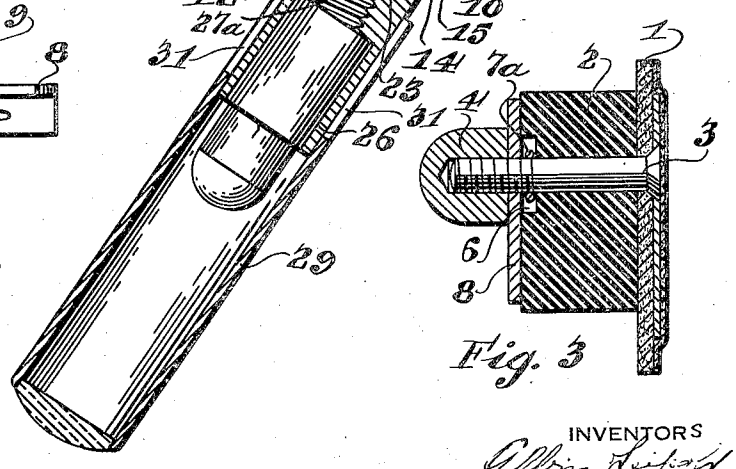


Fig. 3

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ELECTRIC HEAD LAMP

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3 Claims. (Cl. 240—59)

The present invention relates to electric headlamps of the type worn by physicians and others on the head for directing light to a particular spot of small area in performing operations or examinations, and when in use derive the electric current from a low voltage transformer or batteries. The features of the invention, however, are such that it may be used for purposes other than surgery and attached for use other than by a headband.

The primary object of the invention consists in providing a new and improved headlamp structure to swivel universally, and being adapted to swivel to a greater degree downward with respect to the user's head than in the other directions so as to enable the physician using bi-focal lens eyeglasses to direct the light of the lamp straight downward or at any lesser angle from his forehead without readjusting the headband nor disturbing the lamp wiring in the least, thus rendering a more convenient lamp to use and eliminating a common cause of wear and breakage ordinarily occurring in headlamps not thus characterized. With this object in view one feature of the invention is the provision of a ball and socket joint to form the swivelling electrical contact, with a portion of the socket cut away to allow the necked portion of the joint which is made part of the lamp socket to fit into the cutaway recess and thus gain a greater swivelling movement for the lamp socket in the direction of the recess.

Another object of the invention is to provide a new and improved lamp swivelling mechanism wherein regardless of ordinary wear the lamp socket will permanently and securely retain its position frictionally and be easily moved into other positions by a slight pressure of the fingers without moving or disturbing the wiring nor requiring periodic adjustment for maintaining said frictional security. This is accomplished by providing in the ball an insulated spring pressed contact mechanism and the base of the lamp structure with a cooperating contact surface so shaped as to take the direct thrust of the contact spring pressed plunger in whatever swivelled position the latter may be. This latter mechanism assembly is so simple and direct as to eliminate the necessity for additional springs or retaining devices for maintaining the ball and its swivel socket in constant frictional engagement while at the same time functioning as a part of the electrical circuit.

Another object of the invention is to provide focusing means readily adjustable for concentrating or dispersing the light of the lamp bulb so as to obtain an intense light or a mellow light on any desired spot. This is accomplished by the provision of a focusing tube equipped with a lens or lenses of the type desired and adapted to slide along the lamp socket and to grip the same frictionally by the spring tension produced by a swaged portion thereof against the outer body surface of the lamp socket.

A further object of the invention is to provide a new and improved swivel head lamp assembly that can be manufactured into a compact unit and that will be simple in construction, inexpensive to manufacture, comprising few parts easily made and assembled by quantity production methods and highly efficient in use.

These and other novel objects and advantages will be more fully described in the drawings and specifications and more specifically pointed out in the claims at the end hereof.

In the drawing appended hereto Figure 1 is a front elevation partly broken away of my invention showing the lamp assembly together with the head band, electric wire cord, supports for the cord, and the plug for plugging into a transformer or battery circuit. Figure 2 is an enlarged vertical section on the line 2*x*—2*x* of Figure 1. Figure 3 is an enlarged vertical section on the line 3*x*—3*x* of Figure 1. Figure 4 is a front elevation of the insulating block shown in Figure 2. Figure 5 is a side elevation of the insulating block as viewed from the right in Figure 4. Figure 6 is an elevation of the cover plate and swivel socket as viewed from below in Figure 2. Figure 7 is a side elevation and Figure 8 a front elevation of the concavo spherical contact member against which the spring plunger reacts as shown in Figure 2. Similar reference numerals refer to the same parts in all the figures of the drawing.

Referring to the drawing:

The entire lamp assembly is fastened to a headband 1 which is adapted to be secured on one's head so that the lamp assembly will preferably overlie the center of the forehead. The lamp base 2 is a block of insulating material such as hard vulcanized rubber and is attached to the headband by bolts 3 and nuts 4 and has holes drilled through it for said bolts to extend therethrough; one of said holes is enlarged to form a small recess 6 adapted to allow a bare portion of one of the electric circuit wires 7*a* to be coiled therein and around one of the bolts 3 so as to form an electrical contact with the plate 8. The plate 8 is a flat metal piece adapted to serve as a

covering for the block 2 and is bent to follow the contour thereof; the bend as shown in Figure 2 being preferably provided so as to give an initial downward deflection of the lamp housing and for more artistic appearance, a further reason for such downward deflection being to obviate the necessity for the contact surface 10 to project farther into the swivel socket 9 to give support to the plunger 11 when the lamp housing 12 is swivelled to an extreme downward position, thus necessitating more material.

The swivel socket 9 is preferably a tubular section securely attached to plate 8 by swaging and the inner diameter thereof at the end farthest from the plate is taperingly constricted so as to retain the ball 13 of the lamp socket 12 against the pressure of the spring pressed plunger contact 11. Said socket 9 is also characterized preferably by a cutaway portion at 15 to allow the necked portion 14 of the lamp socket 12 to nest therein and thereby swivel to that point more than at any other point around the outer edge of said swivel socket 9, the bottom of said cutaway portion preferably serving as a stop when it engages the necked portion 14 so as to prevent the plunger 11 from swiveling beyond the extremity of the protruding portion of the contact surface 10 and thus breaking the electrical circuit to the lamp or even shortcircuiting the same by contacting contact surface 10 and the swivel socket 9 simultaneously. Socket 9 is further preferably slotted at its base at 16 so as to allow the protruding portion of the contact 10 to extend thereinto without contacting the surface of socket 9, and may be cut away at 15 and 16 or at two other diametrically opposite points enough to permit plunger 11 to disengage itself from contact point 10 without simultaneously engaging socket 9 and contact 10 and thus act as a convenient switch to cut out the electrical circuit.

Contact surface 10 is a cylindrical section of metal rod anchored in a recess in the base 2 completely insulated from the other parts of the lamp and to which is contactively attached, preferably by soldering, the exposed end of the other wire of the electrical circuit 7*b*, the wire 7*a* entering the block 2 through channel 18 and hole 19 with wire 7*b*, but then branching out into channel 20 to form contact with plate 8, while wire 7*b* continues through channel 17 to said contact surface 10.

Contact 10 is so shaped as to be difficult to describe and for convenience is herein referred to as a concavo spherical contact surface from the fact that the surface which cooperates with plunger 11 is substantially so shaped, that is, contact 10 is characterized by a concavo spherical contact surface on its exposed face, the portions of said surface not needed for cooperation with the plunger being cut away so as not to contact socket 9, the result being that an arcuate concavo spherical projection is left extending into the interior of swivel socket 9 through a perforation in plate 8, the concavo spherical member being clearly shown in Figures 7 and 8 and being shown in assembled relation in Figure 2, the purpose of said described shape of member 10 being to furnish a thrust bearing surface for the end of plunger 11 in a plane substantially perpendicular to the thrust axis thereof for whatever swivelled position the latter may assume. The manufacturing accuracy for said surface may vary somewhat from presenting a true right angle surface to said axis at all bearing points, but the accuracy must be such that the plunger 11 and of course the lamp socket of which it is a part will remain in fixed frictional engagement therewith at all times and not slip or slide into a different position while in use from that in which the user swivels and positions the same, the purpose of said projecting portion of contact 10 being to support plunger 11 when the lamp socket 12 is swivelled to extreme position wherein necked portion 14 is in engagement with the bottom of the cutaway portion 15 of swivel socket 9. A variation of the depth of said portion 15 and the length of the projecting portion of member 10 will of course be necessary when provision is made for allowing plunger 11 to disengage itself and slide beyond said projection so as to form a switching device as hereinbefore explained.

The lamp socket 12 is a single piece of metal rod bored with a straight bore through the major portion of its length, to form a cavity 26 and preferably bored and threaded in a smaller diameter 27 for threadedly receiving an incandescent lamp bulb of the type whose filament contacts are made through the metal walls thereof and the center of its threaded portion respectively, this type being the ordinary type of surgical instrument lamp, except that the threaded base thereof has been made smaller in length and diameter to allow for a more compact lamp assembly. The bore continues from said threaded portion in a slightly larger diameter through a portion of the necked portion 14 and through the ball portion 13 to receive the insulated plunger contact assembly by a pressed fit, said assembly consisting of a hollow tube 21 of insulating material such as vulcanized hard rubber pressed into said last mentioned bore as far as the threaded bore 27 where it is restrained by the shoulder formed by the smaller bore 27, two bored metal rings 22 and 23 which are pressed into each end of said tube 21 to retain the plungers 11 and 24 in said tube and a spring 25 for retaining the plungers 11 and 24 under constant pressure by forcing the same oppositely outward against the rings 22 and 23 respectively. As will be noted plunger 11 is provided with a shoulder 26*a* and plunger 24 provided with a shoulder 27*a*, these respective shoulders serving to engage the spring 25 and their respective rings 22 and 23. Two types of contacts may be used to engage the center filament contact of the lamp bulb; the preferred type is the one as shown in Figure 2 and is made as a plunger to react resiliently against said lamp bulb, so as to avoid injuring its delicate contact. The other type is made by providing the ring and the plunger in a solid piece without the advantage of resiliency. In the preferred type shown in Figure 2 both plungers 11 and 24 slide longitudinally in a sliding fit through their respective rings 22 and 23. Contact 24 however is made shorter in length than contact plunger 11 inasmuch as only a slight movement of the former is required.

The focusing tube 29 is a thin walled tube which is made to slideably fit the outer diameter of lamp socket 12 and is provided by a suitable lens or series of lenses preferably a condenser lens at its end and said surface of tube 29 is preferably slit in its rear portion longitudinally to form a series of independent lugs 31 which are bent slightly inward so as to form inwardly extending projections which yield outwardly when the tube 29 is assembled on the lamp housing 12 and moved along its outer surface, the frictional grip created by these inwardly bent portions of the tube 29

serving to frictionally maintain the same in position in focusing the light of the lamp.

The electrical circuit is formed thus; from battery through wire 7*a*, through channel 18, through hole 19, through channel 20, to bolt 3, and plate 8; thence through socket 9, through ball 13, neck 14, the body of socket 12 to the metallic wall of lamp bulb to which is connected one terminal of the filament, thence through the filament to its center contact terminal to contact 24 which is one of the plungers, through spring 25, through plunger 11, and to contact surface 10, regardless of the position to which the lamp 12 and its plunger 11 may be swivelled, thence through wire 7*b*, through channel 17, hole 19, channel 18, and thence to the battery. From channel 18 the two wires 7*a* and 7*b* emerge woven together in ordinary lamp cord fashion, and to keep the cord from out of the user's face and view it is held in little strapped hangers riveted along the head band as is shown in Figure 1.

The preferred embodiment of the invention disclosed herein requires for convenience in assembling the entire lamp that ball 13 be made slightly larger in diameter than the body portion of lamp socket 12 so that the lamp socket 12 may be first inserted from the rear of swivel socket 9 through the perforation in plate 8 and thus cause the ball to be held from going through the other open end of the socket 9 at its reduced diameter because the socket 12 and socket 9 are made on automatic lathes. However, it is possible to secure socket 12 within swivelling socket 9 by swaging socket 9 around ball 13 by punch press in suitable dies and then it will not be necessary to make ball 13 larger in diameter than is the socket 12.

While the improved head lamp with its many novel features has been shown in its preferred form, it will be understood that modifications may be made therein without departing from the spirit and the scope of the invention.

Having thus described our invention what we claim as new and desire to secure by Letters Patent, is:—

1. In a head lamp of the class described the combination of a swivelling lamp socket and a swivel socket having a central spring pressed contact retaining said lamp socket in swivelling relation, said swivel socket having a portion of its peripheral edge cut away so as to allow said lamp socket to swivel therein to a greater degree than at other points of its periphery not so cut away, concavo spherical means with an arcuate concavo spherical projection cooperating with the spring pressed contact in all swivel positions, supporting means for said lamp socket, swivel socket, and last mentioned means, and electrical connections to form an electric lamp circuit with a source of electricity.

2. A ball and socket type swivelling head lamp adaptable on a head band; including an insulating support block; a lamp socket; a swivel socket assembly, consisting of a perforated cover plate for said block to which is secured a swivel socket and assembly means for securing together the entire lamp assembly to said head band; said swivel socket having a portion cut away at its outer rim for engaging the necked portion of a swivel lamp socket to permit greater deflection of said lamp socket in the direction of said cutaway portion; a contact member having a concavo spherical contact surface imbedded in said block and attached to one of the circuit wires, the other wire forming contact with said plate, a portion of said concavo surface extending through a perforation in said cover plate and into the swivel socket in non-contacting relation therewith; said lamp socket removably retaining an incandescent lamp and comprising a tubular member with a substantially ball shaped portion at one extremity and a reduced neck portion adjacent thereto, said ball portion being adapted to swivel with said swivel socket, making electrical contact therewith; a resilient contact assembly in said ball end of the lamp socket comprising a plunger resiliently secured within an insulating tube by which it is insulated from electrical contact with the lamp socket, a contact member in the end of the tube opposite the plunger, and a spring compressed between said contact and said plunger to make electrical connection between the central contact terminal of the lamp bulb and the concavo spherical contact surface while simultaneously urging said ball and swivel socket into frictional and electrical engagement.

3. In combination a ball and socket type swivelling headlamp adapted to be mounted on a body support and comprising an insulating support block adapted to receive electric circuit wires for the lamp; a swivel socket assembly comprising a swivel socket and cover plate for said block; a contact member with a concavo spherical contact surface secured to said block and forming electrical contact with one of the circuit wires, the other circuit wire contacting said swivel socket assembly; a lamp socket contacting electrically said swivel socket and being substantially spherical shaped at one end to swivel smoothly within the swivel socket, and being provided with resilient contact means completing the electric circuit between the concavo spherical contact and an incandescent lamp in said lamp socket, said swivel socket being cut away at diametrically opposite portions of its periphery to admit in one cut away portion a projected portion of the concavo contact in non-contacting relation, and to permit the lamp socket to swivel in the other cutaway portion to a greater degree than where not so cut away.

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