HEAD MOUNTED ELECTRIC SQUINT LIGHT

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Filed Feb. 7, 1966, Ser. No. 525,691

Int. Cl. A61B 3/00

U.S. Cl. 351—2

4 Claims

ABSTRACT OF THE DISCLOSURE

Disclosed is a head mounted unit for aiding in the examination and treatment of human eyes. A blinking light is pivotally mounted on a head strap and movable into the six cardinal directions of gaze as well as up and down. A comic caricature or toy may be illuminated by the light to form an illuminated accommodative fixation target. A second blinking light and illuminated object may be mounted to the head strap in the primary position of gaze. The device is particularly adapted for use in detecting and treating strabismus, and particularly cross-eyes in the very young.

This invention relates to a device usable by ophthalmologists for examining and treating human eyes and more particularly to a head mounted electrically operated unit particularly useful for examining and treating the eyes of small children.

Various visual exercising devices have been provided in the past for treating visual defects, such as strabismus, suppression, amblyopia, myopic reduction, and the like. These defects are basically muscular and very often respond to exercise of the ocular muscles. However, insufficient as applicants are aware these prior devices have been provided largely for the treatment of adult eyes, do not provide optimum convenience for the examining physician, and are completely unsuited for close examination of small children.

As is well known, strabismus or squint is an affection of the eye consisting in non-coincidence of the optic axes. One of the most common occurrences of this condition is that of being cross-eyed. Although early detection and treatment of the condition offers the greatest chances for correcting it, in milder cases in children sometimes go undetected for many years. Furthermore, even when detected, treatment of the very young is made more difficult by their immaturity, particularly their lack of concentration and short interest span, both of which are serious handicaps to adequate treatment of the condition.

The present invention avoids the above-mentioned difficulties by providing a device particularly suited for use by the ophthalmologist in examining and treating small children. Important features of the invention reside in the provision of an electrically controlled instrument providing a blinking fixation accommodative target which will attract and maintain the gaze of the very young. At the same time, the head mounted instrument provides optimum convenience for the examining physician and in particular leaves both hands free so that he may properly manipulate an occluder on one hand and a prism in the other. The light-weight housing unit mounted on a head band allows both hands free for a cross-over, cover-uncover, and simultaneous prismatic measurements. The instrument is constructed so that it may be used by the physician either with or without glasses and in any event does not interfere with his observation of motility defects.

In the present invention, the fixation target is attractively fashioned to provide an interesting accommodative element by housing a blinking light constructed within a small symbol such as a toy or comic strip caricature. Experience has indicated that an ordinary light, whether colored or not, is insufficient to attract and retain the attention of small children. While a blinking light offers some improvement, it has been found that the best results are obtained with a fixation target of the type herein disclosed in the form of a blinking light combined with a colorful symbol such as a toy or a comic strip caricature.

The fixation target is mounted on the end of a lightweight rod so that by gentle manipulation of the rod into pre-set spaces or slots, the fixation target is movable through protracted angular degrees into the six cardinal directions of gaze. Two additional slots are provided for direct up and direct down gaze. In addition, an ancillary blinking fixation target of similar construction is mounted at eye level for nearer measurements in the primary position of gaze. A toggle switch on the head mounted unit allows either fixation target to be flashed independently.

It is therefore one object of the present invention to provide an improved eye examination device.

Another object of the present invention is to provide an improved device usable by ophthalmologists and the like for the examination of patients suffering from strabismus or other ocular muscle defects.

Another object of the present invention is to provide an improved accommodative fixation target for attracting and maintaining the attention and gaze of the very young.

Another object of the present invention is to provide a head mounted examination device which may be conveniently used by the examining physician either with or without glasses, and which leaves his hands free during the examination.

Another object of the present invention is to provide a simplified and inexpensive electrically operated device which may be conveniently used by an examining physician for the detection and/or treatment of ocular muscle disorders.

These and further objects and advantages of the invention will be more apparent upon reference to the following specification, claims and appended drawings.

FIGURE 1 is a perspective view of the novel squint light instrument of this invention.

FIGURE 2 is a plan view of the instrument of FIGURE 1.

FIGURE 3 is a cross section through the instrument cusing of FIGURE 1.

FIGURE 4 is a partial cross section showing the mounting for the fixation target supporting rod of FIGURE 1.

FIGURE 5 is a cross section showing the mounting for the eye level target of FIGURE 1.

FIGURE 6 is a wiring diagram for the squint light instrument of FIGURE 1.
Referring to the drawings and particularly to FIGURES 1 through 3, the novel squint light of the present invention generally indicated at 10 in FIGURE 1 comprises a housing or casing 12 engaged to the examining physician by a strap or headband 14 to which it is attached. As best seen in FIGURE 3 housing 12 is of two-piece construction comprising a front generally U-shaped member 16 and a slightly smaller rear U-shaped member 18 adapted to telescope within front member 16. Front member 16 comprises a metallic front plate 20 integrally joined to a pair of side plates 22 and 24 illustrated in FIGURE 2. These plates are provided with top and bottom overhangs to define U-shaped horizontal flanges such as flange 26 illustrated in FIGURE 1 and flange 28 illustrated in FIGURE 3. Each of these flanges is apertured at two places to receive attaching screws such as screws 30.

Rear U-shaped element 18 comprises a back wall 32 integrally joined to a top wall or plate 34 and a bottom wall or plate 36. Top and bottom walls 34 and 36 are similarly apertured to receive screws 30 so that the front and rear elements may be joined together to form the completely enclosed casing 12.

Bolted to the casing 12 by a pair of bolts passing through back wall 32 is a slightly curved metallic bracket 38. Secured to this bracket is the intermediate portion of headband 14, preferably in the form of a leather strap and having a buckle 40 so that the length of the strap may be adjusted to fit the head of the particular physician using the device. Secured to the intermediate portion of the headband 14 on the side of the band intermediate portion of the headband 14 on the side of the band opposite mounting bracket 38 is a suitable rubber or plastic foam pad adapted to engage the head of the wearer.

Attached to the front plate 20 of casing 12 by means of four screws 44 is an insulated bearing plate 46. While this plate may be formed of any suitable material, it is preferably formed from a low friction bearing material and by way of example only may be made of clear plastic commonly referred to by the trade name "Lucite." Bearing plate 46 is provided with a vertical groove 48, a horizontal groove 50 and a pair of diagonal grooves 52 and 54. Diagonal grooves 52 and 54 form an angle of 25° with horizontal groove 50. The centers of each of these grooves communicate with a quarter-inch diameter hole 56 for the center of the bearing plate such that the grooves form eight radial spokes extending outwardly from the center hole 56 to the edges of the bearing plate.

Rotatable over the front face of bearing plate 46 is a light-weight rod 60 having an integral inwardly projecting arm 62 which is rotatably received in and which passes through hole 56 into the interior of the casing. Suitably secured to the inner end of arm 62 is an insulated plug 64 which carries a conductive metal contact 66. This contact bears upon the resilient spring arm 68 of a conductive metal wiper 70. Wiper 70 is mounted on an insulated block 72 by a pair of screws 74. Block 72 is attached to one of the walls 22 or 24 of the casing member 16 by a pair of screws 76. Soldered or otherwise electrically connected to contact wiper 70 is an electrical lead 78 for a purpose more fully described below. Surrounding inwardly projecting arm 62 of the rod 60 is a coil spring 80. One end of this spring bears upon the inner surface of front plate 20 and the other end of the spring bears against a suitable washer 82. Spring 62 acts as a compression spring and washer 82 is urged against the spring by a nut 84 threaded onto the rod arm 62.

Electrically connected to contact 66 and passing through the center of rod 60 is an electrical lead or wire 86 which is spaced from the interior surface of the metallic plate 20 at appropriate locations by a plurality of insulated spacers such as 88 illustrated in FIGURE 4. Lead 86 terminates in a contact 90 surrounded by additional insulating spacer 92. Spacer 92 is positioned adjacent the end of rod 60 which end is internally threaded at 94 to receive the external threads of a plug 96 attached to a tubular light housing 98. The plug 96 is provided with suitable insulation 100 through which passes a conductor 102 for supplying electric current. Plug 96 is removable so that different lights and symbols may be interchangeably mounted on the end of the conductor. When plug 96 is fully threaded into the end of the rod the conductor 102 engages contact 90 establishing electrical connection to light bulb 104.

Frictionally or otherwise suitably mounted to the end of hollow tubular housing 98 and overlying the luminence end of light bulb 104 is a suitable device or symbol 108 preferably in the form of a small toy, or a figurine such as a doll, a dog, or other animal formed of translucent or transparent material which is plastic and preferably suitably colored to attract the attention of a small child. When light bulb 104 is energized, it lights up and luminesces the colorful and preferably comic character 108 mounted on the end of the tube so as to attract a child's interest.

Referring to FIGURE 5, the lower wall 36 of the back element 18 of casing 12 is suitably apertured to receive threaded plug 110. This plug is attached to the wall 36 by a nut 112 and is provided with a central aperture through which passes an insulated and flexible lead 114. The underside of plug 110 is attached to a tubular light housing 116 which mounts a second subminiature incandescent light bulb 118. Again bulb 118 is mounted to housing 116 by a conductive strap 120 which not only supports the bulb in the housing but grounds one of the bulb terminals to housing 16 and hence to the conductive metal casing 12 of which lower plate 36 forms a part. The end of hollow tubular housing 116 adjacent the luminence end of light bulb 118 is covered over by a transparent or translucent disc 122 suitably attached to its periphery to the housing and provided with a colored caricature again adapted to be illuminated from bulb 118 so as to attract and maintain the attention of a child. As with the device 108 of FIGURE 4, disc 122 may be a doll, an animal, a comic strip character or the like, preferably sufficiently colored to be readily attractive and pleasing to a youngster.

FIGURE 6 is a circuit diagram of the squint light apparatus of the present invention with like parts bearing like reference numerals. Casing 12 is indicated by the dash box 12 in the FIGURE 6 and houses the previously described incandescent light bulbs 104 and 118. Also, mounted in the housing 12 is a two position switch, i.e., a single pole double throw switch 124. This switch is provided with an actuator 126 which passes through wall 22 of casing 12 as illustrated in FIGURE 1, so that the switch may be manually moved between position a and position b illustrated in FIGURE 6. In position a, the switch completes a circuit from input lead 128 passing through a grommet 129 in the wall of the casing to the bulb 104 by way of lead 78. In position b, the circuit is completed through the switch to bulb 118 by way of flexible insulated lead 114.

Also forming a portion of the squint light of this invention is a second casing indicated by dash lines at 130 in FIGURE 6. This casing is constructed similar to casing 12. It is connected to casing 12 by a long cord containing leads 128 and 132. These leads should be sufficiently long and flexible to permit freedom of movement to the physician during examination of a patient with casing 12 mounted on his head and casing 130 near an electrical power supply, and for this purpose should be at least several feet long. Casing 130 contains a step-down transformer 138 having a primary winding...
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140 connected to input terminals 142 and 144. These terminals are adapted to be energized from a 110 volt AC source such as a conventional household outlet.

The transformer steps the voltage down to 6.3 volts at the secondary 146 of the transformer. Connected across the transformer is a blink light 150 which by way of example only may be of the type identified as General Electric #407. This blink light has a filament 152, an internal resistance 156 and a series switch in the form of a pair of bi-metallic contacts 154. In series with blink light 150 across the transformer secondary is a 15 ohm resistor 158. The current through the resistor acts to heat bi-metallic contact 154 over wires 128 and 132 to casing 12 by way of a Jones plug 134 or alternatively by way of an on-off switch 136 as illustrated in dashed lines in FIGURE 6.

When the unit is not connected to a power supply bi-metallic contacts 154 are closed. At this time the lights are all dark. However, when the unit is coupled to the household outlet the transformer is energized and current flows through filament 152. The current to the filament also flows through resistor 148 causing a potential drop across the resistor which is applied by way of leads 128 and 132 through the Jones plug 134 or the on-off switch 136 to contact 128 or 118 in casing 12, depending upon the position of switch 124. After a short time, the filament 152 heats up and this heat is transmitted to the bi-metallic contacts 154 located within the bulb envelope which upon heating separate, thus breaking the circuit to the filament 152. When the bi-metallic contacts are open no current flows through resistor 148 and hence no energy is supplied to either of the bulbs 104 or 118. As the bulb 150 cools, bi-metallic contacts 154 return to their initial position again completing the circuit to the filament 152 and to one of the bulbs 104 or 118 such that the cycle is continuously repeated with the periodic opening and closing of the bi-metallic con-
tacts 154. The result is that the bulb coupled to the lead 128 by way of switch 124 blinks on and off at a suitable attention attracting rate dependent upon the action of bulb 150.

During examination, casing 12 is strapped to the forehead of the examining ophthalmologist such that the lower bulb 118 is approximately at the level of the physician’s eyes and is positioned centrally of the physician’s line of vision and yet the housing 116 is spaced forwardly of the casing a sufficient distance that the unit does not interfere with the physician’s wearing of corrective lenses so as to properly view the patient. The light-weight copper rod 60 is grasped by the physician and rotated into the appropriate one of the slots on the face of bearing plate 46. The overall length of rod 60 is preferably about 5¾ inches with the distance from the center of the rod hole 56 to the bulb 104 about 4½ inches. With these dimensions the rod may be manually moved against the action of spring 80 into the slots on the face of the bearing plate so that the bulb 104 may be moved into any one of the six cardinal positions of vision and into the vertical up and down positions consistent with normal operating distances which generally are on the order of one-third of a meter. That is, the bulb 104 on the physician’s forehead is at a distance of approximately one-third of a meter from the eyes of the patient during examination and treatment, and with this in mind, the length of the rod 60 is chosen to bring the bulb 104 into appropriate position. This may be done by the physician simply taking his finger and engaging the copper rod 60 to slide it over the face of bearing plate 45 to the appropriate slot into which it falls under the urging of compression spring 88 bearing against the washer 82 carried by arm 62 in FIGURE 4. When switch operator 126 is manipulated by the examining physician’s finger from position a to position b in FIGURE 6, blinking light 104 is de-energized and light 118 is energized so that this light now blinks in a manner to attract the patient’s view in the principal line of sight, i.e., directly into the eyes of the examining physician.

It is apparent from the above that the present invention provides an improved electrically operated instrument which makes it quite convenient for the physician to examine the eyes of the patient and particularly those of a very young child. Since the unit is strapped to the physician’s head and connected to a suitable power supply and to the power casing 130 by an elongated cord, the physician is free to move about and may have both hands free so as to manipulate occluding devices, pellets, and the like used during the examination. In one embodiment of the invention, casing 12 was 2¾ inches wide, 2 inches high and 1¾ inches deep.

An important feature of the present invention is the provision of the blinking light and illuminated toy, picture, or caricature particularly adapted to attract and retain the attention of a small child so that the child will focus his gaze at the blinking object. The use of the device has been found to be quite satisfactory and pleasing to children and greatly facilitates their examination at an early age when mending defects can be detected and corrected. While described in conjunction with a toy, comic character or other figure, it should be noted that the important thing is that the illuminated object be pleasing or attention-attracting to children, and that the object be periodically illuminated, i.e. in a blinking fashion since it has been found that children are not nearly as attention-getting for children and will not hold their attention for sufficient lengths of time to complete the examination. A blinking light alone has been found satisfactory in certain instances, but in most cases, it is necessary to combine the two features, i.e., the blinking illumination with a colorful object in addition to the light which is in itself attractive to children.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. An eye examination device comprising a support, means for attaching said support to the head of a wearer, an arm rotatably mounted on said support, a blinking light carried by said arm and movable with said arm into a plurality of positions with respect to said support, an object attractive to children mounted on said arm for illumination by said blinking light, said object being mounted in front of said light with both positions approximately 12.7 centimeters from the rotational axis of said arm whereby said light and object are moved into the six cardinal positions of view for a patient approximately ⅛ of a meter from said light and object, a second blinking light on said support positioned directly in front of the eyes of the wearer when said support is attached to the wearer’s head, said support including a bearing plate having a plurality of radial grooves, said arm being rotatable over said plate into one of said grooves, and means resiliently urging said arm toward said plate whereby said arm falls into one of said grooves when aligned with it.

2. A device according to claim 1 including a second object attractive to children mounted in front of said second light and illuminated thereby.

3. A device according to claim 1 wherein said plate has vertical and horizontal grooves and also diagonal grooves at an angle of 25 degrees to the horizontal.
4. A device according to claim 1 wherein said attaching means comprises a headband for attaching said support to the forehead of a wearer.

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DAVID SCHONBERG, Primary Examiner

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U.S. Cl. X.R.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,484,155 Dated December 16, 1969

Inventor(s) DONALD L. PRAEGER ET AL

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, lines 31 and 32, delete "on the side of the band intermediate portion of the headband 14"

SIGNED AND SEALED
JUN 23 1970

(SEAL)
Attest:
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Commissioner of Patents