Nov. 7, 1961 W. C. MOORE 3,008,040

HEADLAMP

Filed Jan. 19, 1959 2 Sheets-Sheet 1

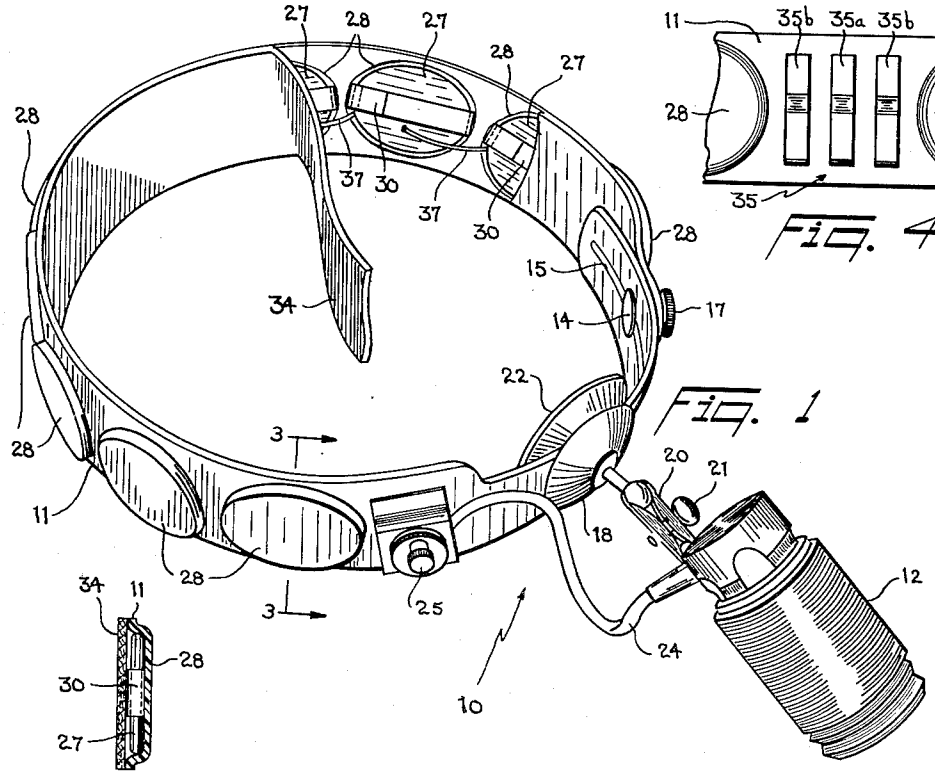


Fig. 1

Fig. 4

Fig. 3

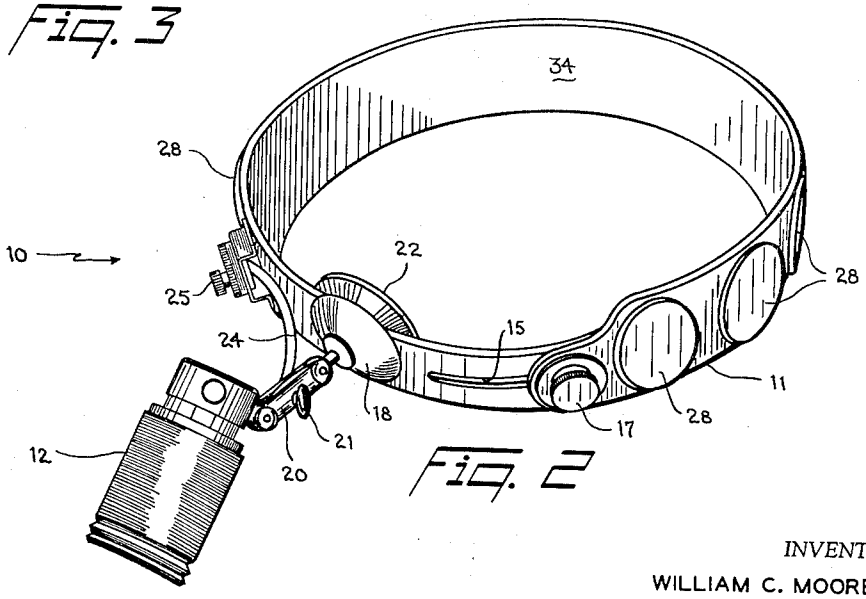


Fig. 2

INVENTOR.
WILLIAM C. MOORE
BY Richard von K. Bruns
Attorney

Nov. 7, 1961 W. C. MOORE 3,008,040

HEADLAMP

Filed Jan. 19, 1959 2 Sheets-Sheet 2

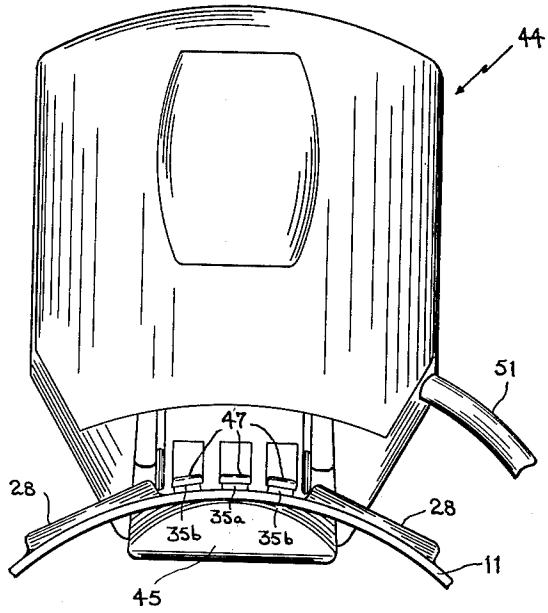


Fig. 5

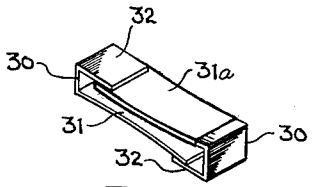


Fig. 6

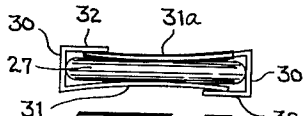


Fig. 7

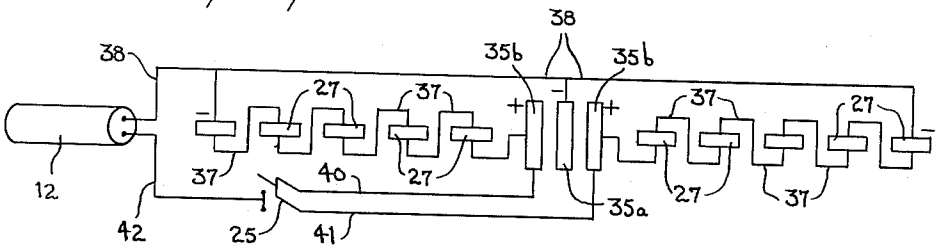


Fig. 8

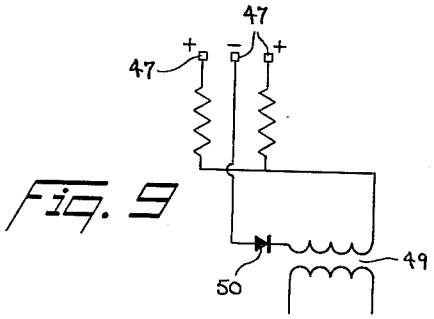


Fig. 9

INVENTOR.

WILLIAM C. MOORE

BY

Richard van K. Brimm

Attorney

United States Patent Office 3,008,040 Patented Nov. 7, 1961

3,008,040

HEADLAMP

William C. Moore, Skaneateles, N.Y., assignor to Welch Allyn, Inc., Skaneateles Falls, N.Y., a corporation of New York

Filed Jan. 19, 1959, Ser. No. 787,693
6 Claims. (Cl. 240—41.15)

This invention relates generally to headlamps of the type used by physicians and surgeons for illuminating a field of observation when treating a patient. More particularly, the invention has reference to a novel headlamp having a self-contained source of electrical energy in the form of rechargeable "button" cells and to a recharger unit for use with same.

In medical practice it is often essential that the physician or surgeon have both hands free for manipulation of his instruments, and at the same time, that there be a close source of light for illuminating the particular area of the patient being treated. In such instances, doctors frequently utilize an electric lamp which is supported by an adjustable band worn on the doctor's head. These headlamps or headlights provide an effective source of illumination but the presently available types depend upon an outside source for current because, heretofore, headlamps having a self-contained source of electrical energy, as for example miners' lamps, have been too cumbersome and heavy for medical use.

As a result, the medical headlamps in use at the present time require a long attachment cord which is objectionable to the doctors because it gets in the way. In addition, this type of headlamp usually requires the use of a step-down transformer which is an added expense to the doctor.

In order to eliminate these disadvantages, the present invention contemplates and has as its primary object the provision of a lightweight, comfortable medical headlamp having a self-contained source of electrical energy so that entangling cords or the like are not needed.

Another important object of the invention is to provide a headlamp which is constructed so that small rechargeable cells can be utilized as the current source, the headlamp assembly including a built-in charging circuit for the cells.

A further important object of the invention is to provide, in combination with the rechargeable cell headlamp, a convenient recharger unit in which the headlamp may be stored and recharged when not in use.

Another important object of the invention is to provide a rechargeable cell headlamp which can be made explosion proof for operating room use.

Still another important object of the invention is to provide a headlamp of the character described which is capable of long, trouble free service at a minimum operational cost.

A still further important object of the invention is to provide a headlamp of the character described which is adjustable to different head sizes and is compact and attractive in appearance.

Other objects and advantages of the invention will become apparent from the following detailed description thereof read in conjunction with the accompanying drawings which illustrate a representative embodiment of the invention for the purpose of disclosure.

In the drawings:

FIGURE 1 is a top perspective view of a rechargeable cell headlamp embodying the invention;

FIGURE 2 is a top perspective view of the headlamp from a different angle than FIGURE 1;

FIGURE 3 is a vertical cross section through the headband of the headlamp taken substantially along line 3—3 of FIGURE 1;

FIGURE 4 is a fragmentary rear elevation of the headband showing the external contacts for the cell recharging circuit;

FIGURE 5 is a front elevation of the recharger unit with a fragmentary portion of the headband being shown in engagement therewith;

FIGURE 6 is a slightly enlarged perspective view of the constrictor elements for the cells;

FIGURE 7 is a side elevation of the constrictor elements assembled in position on a cell;

FIGURE 8 is a wiring diagram of the electrical circuit for the headlamp; and

FIGURE 9 is a wiring diagram of the electric circuit for the recharger unit.

Having reference now to the drawings, wherein like reference numbers designate the same part in each of the views, **10** generally indicates the headlamp in which the principal components are a flexible headband **11** and a lamp **12** adjustably attached to the headband. The headband **11** is a strip of relatively thin, moldable material the ends of which are adjustably secured together as by a screw and slot connection to allow the band to be adapted to the head size of the wearer. Thus, a flat headed screw **14** extends through a slot **15** in one end of the strip and a hole in the other end, and a nut **17** on the screw can be tightened to clamp the ends together in the adjusted position.

The lamp **12** is a direct focusing light which is attached to a plate **18** on the headband as by a double ball and socket connector **20**, a thumb screw **21** on the connector serving to hold the lamp in the angular position into which it has been moved. On the inside of the headband, opposite the attachment plate **18**, is a soft rubber pad **22** which engages the forehead of the wearer and holds the front portion of the band out of direct contact therewith. The electrical connections to the lamp are made through the metal attachment plate **18** and connector link **20** to one bulb terminal and through an insulated conductor **24** which leads from a switch **25** to the other bulb terminal.

In accordance with the invention, the source of electrical energy for the lamp **12** is self-contained within the headband **11** and comprises a plurality of small rechargeable batteries **27**, known in the trade as "button" cells. These button cells are disc shaped and are approximately the size of a half dollar, commercially available nickel cadmium sintered-plate batteries being employed in practical applications of the invention. In the embodiment illustrated, wherein the lamp is rated at 6 volts, ten button cells rated at 1.2 volts each are utilized, the cells being arranged in two groups of five series connected cells and the groups themselves being connected in parallel across the lamps as will be described more fully hereinafter.

In order to accommodate the cells **27** in the headlamp so that they do not encumber the device or cause it to have an ungainly appearance, the headband **11** is formed with a plurality of circumferentially disposed recesses or pockets **28** in which the cells are positioned. To this end, the band is preferably made of plastic material and the pockets are formed by molding whereby substantially circular portions of the band are displaced outwardly from the interior thereof as shown. The depth of these pockets is slightly greater than the thickness of the cells so that when the latter are positioned in the pockets, their inner walls do not extend beyond the inner surface of the band, see FIGURE 3.

To perform properly, rechargeable cells of the type under consideration must be constricted or, in other words, a moderate inward pressure must be exerted on the opposite sides thereof. This is accomplished in the present invention by providing each cell with a pair of interlocking

constrictor elements 30 which are mounted on the cell as shown in FIGURES 1, 6 and 7. These elements are formed of spring metal, and the long leg 31 of each element is sufficiently concave so that when its free end is positioned beneath the short leg 32 of the other element, FIGURE 7, the mid-portions of the long leg will exert in the range of 10–15 lbs. pressure on the side of the cell which is sufficient to ensure proper operation thereof at all times.

The diameter of the pockets 28 is such that the cells with the constrictor elements mounted thereon will fit in the pockets with a snug fit, and as previously noted, the depth of the pockets is slightly greater than the thickness of the cells so that the inner sides of the constrictor elements are substantially flush with the inside surface of the headband as indicated in FIGURE 3. In order to prevent the cells from coming into direct contact with the head of the wearer, and also to conceal the cells and associated wiring from view, an inner sponge rubber or leather band 34 is positioned over the cells and adhesively secured to the inside surface of the main headband 11. In the alternative, the band 34 can be made of plastic and secured to the main headband as by heat sealing.

To facilitate charging the cells 27, three charging circuit contacts or terminals 35 are located on the outside of the headband 11 approximately diametrically opposite the lamp 12. Five of the cells are disposed around the band on each side of these contacts and, as shown in the wiring diagram of FIGURE 8, the cells in each five cell group are connected together in series by conductors 37. The negative side of each cell group is connected to the center charging contact 35*a* and to one terminal of the lamp 12 by conductor 38. The positive side of each cell group is connected directly to one of the outside charging contacts 35*b* and from thence through the conductors 40, 41 to one side of the switch 25, the other side of the switch being connected by conductor 42 to the other lamp terminal.

With the above described circuit arrangement, the headlamp is put into operation by closing the switch 25 which completes a circuit from the negative side of each cell group through the lamp, switch and contacts 35*b* back to the positive side of each cell group, the center contact 35*a* being open. This comprises the discharging circuit of the arrangement since the current is being supplied from the cells to illuminate the lamp. When it is desired to recharge the cells, the switch 25 is opened to turn off the lamp, and current from an outside source to be presently described is applied to the contacts 35 so that a charging or recharging circuit is established from the outside contacts 35*b* through the series connected cells and back to the center contact 35*a*.

Referring again to FIGURE 1, it has been found that one simple method of making the cell wiring connections is to solder one end of a conductor 37 to one side of each cell before assembling same in the headband. Each cell is then placed in its pocket 28 with the soldered connection against the back wall thereof so that the free end of the conductor comes out of the pocket at the side of the cell and can be quickly soldered to the exposed side of the next adjacent cell. In this connection, it should be mentioned also that the long leg 31 of one of the constrictor elements 30 for each cell is provided with a thin covering of insulating material 31*a* which prevents the constrictor assembly from short circuiting the cell. The other conductors which complete the circuit arrangement of FIGURE 8 are not shown in FIGURE 1, but these are positioned between the main headband 11 and soft inner band 34 so that they are concealed from view.

The recharger unit for the headlamp, which is preferably wall mounted, is indicated generally at 44 in FIGURE 5 and provides a convenient storage place for the headlamp as well as a source of energy for recharging the cells during idle periods. Thus, when the headlamp is not in use, it is simply hung on the recharger unit by sliding the back of the headband between a bottom supporting shoe 45 and spring contacts 47 so that the latter engage the band contacts 35. The charging circuit for the recharger unit is shown in FIGURE 9 and comprises a transformer 49 and rectifier 50, the secondary winding of the transformer and the rectifier being connected to the spring contacts 47 as indicated and the primary of the transformer being connected by means of a conventional line cord 51, FIGURE 5, to a suitable wall outlet.

The recharger unit keeps the batteries at full charge so that the headlamp is always ready for use and ensures ample current for maximum illumination thereby. By proper selection of the values of the electrical components, the unit can be made to deliver a trickle current which can be applied to the cells indefinitely without damage.

From the foregoing description, it will be apparent that the invention provides a novel and highly practical rechargeable cell headlamp and recharger unit therefor. With the arrangement described, the need for entangling attachment cords is completely eliminated and yet the headlamp is lightweight, compact and sufficiently flexible to be worn with comfort.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The embodiment disclosed is therefore to be considered in all respects as illustrative rather than restrictive, the scope of the invention being indicated by the appended claims.

What is claimed is:

1. In a device of the character described, a flexible non-metallic headband formed with a plurality of recesses in the inside surface thereof, a plurality of rechargeable button cells mounted in said recesses, means to exert a pressure on the opposite sides of said cells, a lamp mounted on said headband, means on said band to conduct current from said cells to said lamp, a plurality of electrical contacts mounted on the outside surface of said headband for connecting same to an outside source of electrical current, and means on said band to conduct current from said contacts to said cells for recharging the cells when the contacts are connected to the outside current source.

2. Structure as defined in claim 1 in combination with a recharger unit having means to support said headband when not being worn, said unit including a charging circuit having a plurality of contacts engageable with said headband contacts when the headband is positioned on the unit.

3. In a headlamp for physicians, surgeons and the like, a flexible headband formed with a plurality of individual pockets in the inside surface thereof, a relatively thin rechargeable cell positioned in each of said pockets, said pockets being formed to receive said cells with a snug fit and being of a depth such that the inner side of each cell is substantially flush with the inside surface of the headband, a band of soft, yieldable material overlying the inner sides of said cells and the inside surface of said headband to separate same from direct contact with the head of the wearer, a lamp adjustably mounted on said headband, a switch mounted on the band adjacent said lamp, means on said band to conduct current from said cells to said lamp when said switch is closed, and additional means on said band to conduct current supplied from an external source to said cells for recharging same when said switch is open.

4. A headlamp as defined in claim 3 wherein each rechargeable cell includes constrictor means for exerting pressure on the opposite sides of the cell.

5. A headlamp having a self-contained source of electrical energy comprising a flexible non-metallic headband formed with a plurality of circumferentially disposed circular recesses in the inside surface thereof, a relatively thin rechargeable button cell positioned in each of said pocekts, constrictor means mounted in each of said pockets in engagement with the cell positioned therein for exerting a pressure on the opposite sides of the cell, said pockets being formed to receive said cells and constrictor

means with a friction fit, the depth of said pockets being such that the inner side of each cell is substantially flush with the inside surface of the headband, a band of soft, yieldable material overlying the inner sides of said cells and the inside surface of said headband to separate same from direct contact with the head of the wearer, a focusing lamp adjustably attached to said headband, a switch mounted on said band adjacent said lamp, means on said band to conduct current from said cells to said lamp when said switch is closed, a plurality of electrical contacts mounted on the outside surface of said headband for connecting same to an outside source of electrical current, and means on said band to conduct current from said contacts to said cells for recharging the cells when the contacts are connected to the outside current source.

6. A headlamp as defined in claim 5 wherein said cells

are arranged in groups, the cells within each group being electrically connected in series and the groups being connected in parallel to said lamp.

References Cited in the file of this patent

UNITED STATES PATENTS

2,027,298	Wheat	Jan. 7, 1936
2,049,660	Patten	Aug. 4, 1936
2,176,789	Capitani	Oct. 17, 1939
2,539,104	Rodel	Jan. 23, 1951
2,876,410	Fry	Mar. 3, 1959

FOREIGN PATENTS

264,124	Switzerland	Sept. 30, 1949
795,068	Great Britain	May 14, 1958