

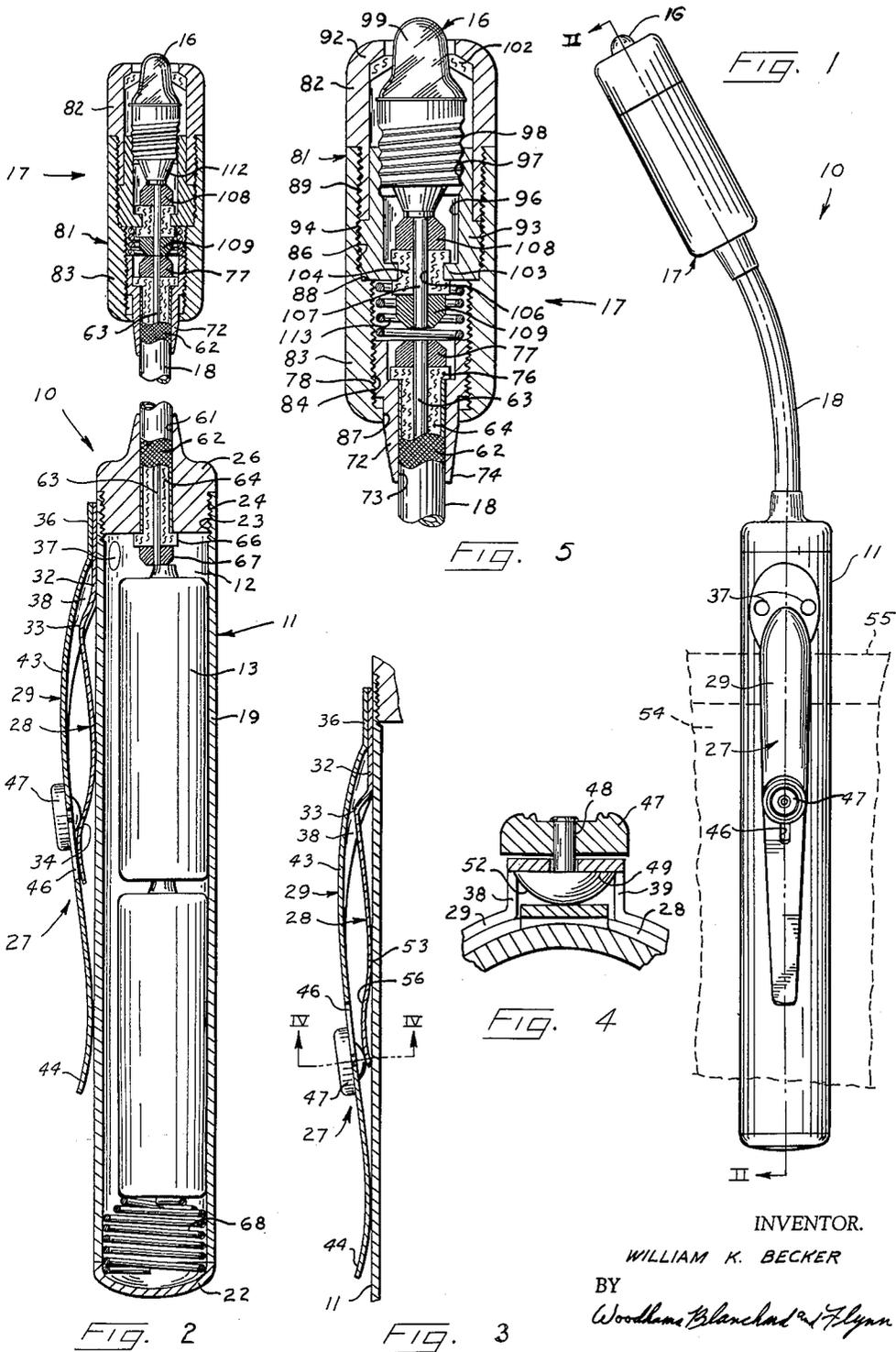
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W. K. BECKER

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INSPECTION DEVICE

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INVENTOR.  
WILLIAM K. BECKER  
BY  
*Woodlame Blanchard & Flynn*  
ATTORNEYS

1

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INSPECTION DEVICE

William K. Becker, Cooper Township, Kalamazoo County, Mich., assignor to Aero-Motive Manufacturing Company, Kalamazoo, Mich., a corporation of Michigan

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2

This invention relates in general to an inspection light and, more particularly, to a type thereof which can be firmly and releasably secured upon the clothing of the user and which is arranged so that the operation of the light source and the direction of its beam can be easily controlled by one hand.

Persons who in the course of their work find it necessary or desirable to use illumination in zones of limited access are well aware that many types of inspection lights have been developed for this purpose. The existing battery operated lights having small incandescent lamps mounted upon the end of a gooseneck cable have been of great help to these people. However, in the continuing effort to improve upon existing inspection lights, not only for their present uses but for further uses, it has been found that existing inspection lights have, in general, had certain shortcomings.

In the first place, most existing inspection lights are designed to be hand-held, which obviously restricts the activities of its user. Where two hands are required to perform the work, the inspection light is usually rested upon or near the work and, therefore, must be manually moved each time the precise point of operation is changed. In order to overcome this problem, some efforts have been made to use a pocket clip on the inspection light, which clip serves not only to prevent loss of the light when it is not in use, but also permits movement of the light with and by the user without using the hands. However, existing pocket clips of this type are not designed to hold the inspection lamp in any selected position with respect to the clothing of the user upon which the light is mounted. Accordingly, as the user moves from one position to another, the light tends to slip and shift upon the clothing and, as a result, it is usually just as inefficient as though it were simply supported upon or near the work and moved as required.

Another problem has been concerned with the switch for connecting and disconnecting the lamp to the batteries. Usually, some type of switch mechanism is provided on the casing in which the batteries are stored. Thus, where the inspection light has a fairly long gooseneck, the switch may be either at an inconvenient distance from the point at which the user of the light is working or it may be in an inaccessible position. For example, the light may be positioned so that the switch is on the bottom side of the casing or, where the casing is supported by a clip upon a part of the user's shirt, the switch may be inside of the pocket of the shirt. Thus, in order to avoid this problem the user of the light will often create a further problem by permitting the light to operate even during periods when illumination is entirely unnecessary. This naturally results in a much shorter useful life of the batteries which results in both an increased cost and the nuisance of frequently replacing the batteries.

Accordingly, the primary object of this invention has been the provision of an inspection light having an improved clip mechanism for removably supporting the light upon the clothing of its user in a selected position.

A further object of this invention has been the provision of an inspection light, as aforesaid, having a flexible cable extending between the casing containing the

batteries and the lamp-supporting head, and wherein said lamp-supporting head is constructed with a self-contained switch which can be operated easily by one hand without changing the position of the lamp-supporting head, the gooseneck cable or the battery-containing casing, and without using the other hand to hold the light.

A further object of this invention has been the provision of an inspection light, as aforesaid, which is neat in appearance, light in weight, completely foolproof in operation, relatively inexpensive to produce, capable of withstanding rigorous use and particularly adapted so that it can be effectively used in a variety of new circumstances while, at the same time, improving its performance for its existing uses.

Other objects and purposes of this invention will become apparent to persons familiar with this type of equipment upon reading the following descriptive material and examining the accompanying drawings, in which:

FIGURE 1 is a side elevational view of an inspection light embodying the invention.

FIGURE 2 is a broken sectional view taken along the line II—II in FIGURE 1.

FIGURE 3 is a fragment of FIGURE 2 showing parts thereof in different positions of operation.

FIGURE 4 is a sectional view taken along the line IV—IV in FIGURE 3.

FIGURE 5 is a fragment of FIGURE 2 showing parts thereof in different positions of operation.

For convenience in description, the terms "front," "rear" and words of similar import will have reference to the upper and lower ends respectively of the inspection light embodying the invention as appearing in FIGURES 1 and 2. The terms "inner," "outer" and derivatives thereof will have reference to the geometric center of said inspection light and parts thereof.

*General Description*

The objects and purposes of the invention, including those set forth above, have been met by providing an inspection light having a casing containing a battery compartment, a flexible cable extending from one end of said casing and a lamp supporting head mounted upon the outer end of the cable. An improved pocket clip is mounted upon the casing for the purpose of supporting the inspection light in a selected position upon the clothing of its user. The lamp-supporting head contains a switch which is operated by rotating the head around its lengthwise axis for the purpose of electrically connecting or disconnecting the lamp from the batteries.

*Detailed Construction*

The inspection light 10 (FIGURES 1 and 2), which has been selected to illustrate a preferred embodiment of the invention, is comprised of an elongated hollow casing 11 having a compartment 12 in which the batteries 13 are disposed. The casing 11 is connected by a flexible cable 18 to the head 17 in which a lamp 16 is removably held. The casing 11 (FIGURE 2) may be an elongated cylindrical tube having a side wall 19 and one end wall 22. The open end of the casing 11 is internally threaded at 23 to receive the threaded end 24 of the end cap 26.

A pocket clip assembly 27 (FIGURES 1, 2 and 3), which is mounted upon the casing 11, includes inner and outer, elongated clip elements 28 and 29, which extend lengthwise of said casing. The inner clip element 28 (FIGURES 2 and 3) has a relatively wide, front end portion 32 which is transversely curved to embrace the casing 11 near the front end thereof. The central portion 33 of the element 28, which is resiliently flexible, is bowed away from the casing 11. The rear end portion 34 of element 28 curves outwardly from a point of con-

3

tact with the casing 11 and, near its tip, is flared inwardly toward said casing.

The outer element 29 (FIGURES 1 and 2) has a relatively wide front end portion 36, which is preferably, but not necessarily, of approximately the same size and shape as the front end portion on the inner element 28. Said front end portion 36 is also transversely curved so that it fits snugly against and embraces the outer surface of the front end portion 32 on the clip element 28. The front end portions 32 and 36 are rigidly secured to the casing by a pair of rivets 37 which extend through appropriate, aligned openings in said front end portions and said casing 11 near the front end thereof, whereby said elements 28 and 29 are held in superimposed positions extending lengthwise of the casing.

The outer element 29 has a central portion 43 which is bowed outwardly away from the casing 11 and also away from the inner element 28, except at the flared tip on the rear end portion 34 which engages the inner surface of the central portion 43. The rear end portion 44 of element 29 curves outwardly from a point of contact with the casing 11 which point of contact is spaced rearwardly a substantial distance from the rearward end portion 34 of the inner element 28. More specifically, the outer element 29 in this particular embodiment is approximately 50% longer than the inner element 28, and the outer element 29 contacts the inner element only at the opposite ends of said inner element. The front part of the bowed portion 43 in the outer element 29 is stiffened by inwardly projecting flanges 38 and 39 which are integral with, and extend along the edges of, said front part. The rear part of the bowed portion 43 is resiliently flexible, but is preferably slightly stiffer than the inner element 28.

The rear part of the central portion 43 (FIGURES 1, 2 and 3) is provided with an elongated slot 46, which is disposed adjacent the rear end portion 34 of the inner element 28 and is preferably located midway between and lengthwise of the lateral edges of said central portion 43. The rear part of the central portion 43, which contains the slot 46, preferably converges with the casing 11 toward the rearward end thereof.

A manually engageable button 47 (FIGURES 1 and 2) is mounted upon the external surface of the outer element 29 by means of the pin 48 (FIGURE 4) which is secured to the inner side of the button and slidably extends through the slot 46 for limiting movement of the button 47 lengthwise of the element 29. The pin 48 has on its inner end an integral head 49 having a curved cam surface 52 adjacent the inner element 28 and engageable therewith. The head 49, the slot 46 and the rear end portion 34 of the inner element 28 are so designed and arranged that, when the pin 48 is at the front end of the slot, the head 49 does not interfere with the engagement between said rear end portion 34 and the adjacent surface on the outer element 29. However, when the pin 48 is moved by the button 47 to the rearward end of the slot 46, then the head 49 is disposed directly between the rear end portion 34 of the inner element 28 and the opposing side of the outer element 29. Inasmuch as the outer clip element 29 is substantially more rigid than the inner clip element, the positioning of the head 49 between the end portion 34 and the outer element 29 causes the contact region 53 on the inner element 28 to be pressed tightly and firmly toward the casing 11. Thus, if a piece of fabric such as the pocket indicated by broken lines at 54 in FIGURE 1, is disposed between the contact region 53 (FIGURE 3) and the casing 11 when the pin 48 is in its rearward position, said fabric is tightly gripped between the inner element 28 and said casing 11.

The slight inward flaring of the rear end portion 34 produces a high point 56 in said rear portion 34 over which the surface 52 on the head 49 must move as the pin 48 approaches or departs the rearward end of the

4

slot 46. This high point 56 thus tends to lock the head 49, hence the pin 48, in its rearward position and against accidental movement toward the front end of the slot 46. The surface 52 on the head 49 acts in the nature of a cam as it moves along the rear end portion 34 of the inner element 28.

The end cap 26 for the casing 11 has a concentric, central opening 61 which communicates with the compartment 12, and in which the inner or rearward end of the cable 18 is snugly disposed and held. The cable 18 is comprised of an outer, electrically conductive and cylindrical sheath 62, a centrally disposed, electrical conductor 63 and a cylindrical insulator 64 which electrically insulates the conductor from the sheath. The insulator 64 has an external, annular flange 66 adjacent the rearward end of the end cap 26, which flange extends radially outwardly of the sheath 62. A terminal 67 is secured to the inner end of the conductor 63 and is insulated from the end cap 26 and the sheath 62 by the flange 66 for engagement by a terminal on the adjacent battery 13. An electrically conductive spring 68 is disposed between the end of the rearwardmost battery 13 and the end wall 22 for urging said batteries 13 against each other and against the terminal 67.

The lamp head 17 (FIGURES 2 and 5) includes a base member 72 having a central opening 73 with a portion 74 of reduced diameter at its rearward end in which the front end of the cable 18 is snugly received and held. An external, annular flange 76 on the front end of the cylindrical insulator 64 insulates the terminal 77 on the front end of the conductor 63 from the sheath 62 and the base member 72 which are electrically connected. The front surface on the front terminal 77 is preferably, but not necessarily, adjacent the front end of the base member 72 which has external threads 78. If desired a protective coating may be applied to the outer surface of the cylindrical sheath 62 between the end cap 26 and the base member 72.

The head 17 (FIGURE 5) also includes an elongated, cylindrical and hollow sleeve 81 having front and rear sections 82 and 83. The rear section 83 has a coaxial opening with two internally threaded portions 84 and 86 of different diameters. The rearward threaded portion 84, which has the smaller diameter, is threadedly engaged with the external threads 78 on the base member 72. Said rear section 83 has an inwardly extending, annular flange 87 which positively limits forward movement of the rear section 83 along the base member 72. The difference in diameter between the threaded portions 84 and 86 provides a frontwardly facing, annular shoulder 88.

The front section 82 of the sleeve 81 (FIGURE 5) has external threads 89 on its rearward end for threaded reception into the front threaded portion 86 of the rear section 83. Said front section 82 has an inwardly extending, annular flange 92 at its front end for reasons appearing hereinafter. A substantially cylindrical lamp socket 93 has external threads 94 at its rearward end which are threadedly engageable with the internal threads 86 in the front end of the rear sleeve section 83. Normally, the threads 94 are located between the shoulder 88 and the rear end of the front section 82. The lamp socket 93 has a central opening 96 the front end of which has internal threads 97 for threaded engagement with the threaded base 98 of a lamp 16. In this particular embodiment, the lamp 16 is of the type having a small filament envelope 99 which can project through the opening defined by the annular flange 92. A ring 102 of insulation material encircles the envelope 99 adjacent the annular flange 92 and thereby protects the lamp 16 while holding it in position with respect to the front sleeve section 82.

The lamp socket 93 (FIGURE 5) has an inwardly extending, annular flange 103 at its rearward end adjacent the shoulder 88, through which an annular insulator 104 is snugly received and in which said insulator is held by

5

flanges at the opposite ends thereof. Said insulator 104 has a central opening 106 through which an electrical conductor 107 extends for securement to, and electrical connection with, front and rear terminals 108 and 109 at the opposite ends thereof. The front terminal 108 is engageable by the central terminal 112 in the lamp base 98, when said lamp is received in the socket 93. The rear terminal 109 is engageable with the front terminal 77 on the conductor 63 in response to rearward movement of the sleeve 81 with respect to the base member 72. Resilient means, such as the coil spring 113, is preferably disposed between the front end of the base member 72 and the rear end of the lamp socket 93 for urging the lamp socket, hence the entire sleeve 81, frontwardly from the base member 72.

#### Operation

The inspection light 10 (FIGURE 2) of the invention is prepared for operation by removing the end cap 26, inserting one or more appropriate batteries into the compartment 12 and returning the end cap 26 to its position on the casing 11. A lamp 16 is inserted into the lamp socket 93 after the front sleeve section 82 is removed from the rear section 83 thereof. It will be observed that the front sleeve section 82 serves primarily as a device for protecting the envelope of the lamp 16 since the lamp is held within the rear sleeve section 83 by the lamp socket 93. By rotating the sleeve 81 in one direction, it is moved along the base member 72 away from the terminal 77 therein, so that the electrical connection is broken between said terminal 77, which is connected to the batteries 13, and the terminal 109 which is connected to the lamp 16. Accordingly, when it becomes desirable to light the lamp 16, the sleeve 81 is simply rotated in the opposite direction whereby it moves toward the casing 11 to effect electrical contact between the terminals 77 and 109.

With the clip assembly in its position of FIGURES 1 and 2, it is in condition for normal engagement with an edge portion of a garment, such as a pocket or the button flap on a shirt front. Specifically, the edge 55 of the pocket 54 is moved frontwardly along the casing 11 beneath first the rear end portion 44 of the outer element 29 and then the rear end portion of the inner clip element 28, preferably until said edge 55 of said pocket is adjacent the front end portion 32 of the inner clip element 28. The button 47 is now manually engaged and moved rearwardly along the outer element 29 until the pin thereon engages the rearward end of the slot 46 as appearing in FIGURES 2 and 4. During such movement, the cam surface 52 on the head 49 will move along the adjacent outer surface of the rear end portion 34 on the inner element 28 over the high point 56 thereof and into a substantially locked position between the outer element 29 and the rear end portion 34. Since the outer element 29 is relatively rigid by comparison with the inner clip element 28, such rearward movement of the head 49 effects an inward flexion of the rear end portion 34 whereby the inner element 28 is caused to press the fabric 54 of said pocket tightly against the casing 11. It has been found that this clamping action between the inner element and the casing 11 is so effective that disengagement therebetween cannot be accidentally effected and, in fact, requires the application of a substantial amount of force applied to the light 10 and pocket 54 in opposite directions. Yet, as soon as the button 47 is moved back into its FIGURE 2 position, the light 10 can be removed from its engagement with the pocket 54 by applying the amount of force normally required to effect a disengagement between a pocket and a conventional pocket clip.

It will be apparent that the clip assembly 27 can be used for the support and securement of other types of devices which, for example, are advantageously carried within or upon a breast pocket or the like. Thus, although a particular preferred embodiment of the invention has been disclosed in detail above for illustrative pur-

6

poses, it will be understood that variations or modifications of such disclosure, which come within the scope of the appended claims, are fully contemplated.

What is claimed is:

1. A clip assembly for an inspection light, comprising:
  - a first elongated element extending lengthwise along said casing between first and second points on said casing, said element being secured to said casing at said first point and engageable with said casing at said second point, the central portion of said first element being spaced from said casing and said first element being stiffer near said first point than near said second point;
  - a second elongated element secured at one end to said casing adjacent said first point thereon and engageable between its ends with said casing at a third point thereon near said central portion of said first element, said second element having an end portion closely adjacent said first element between said second and third points, said end portion of said second element being more flexible than the adjacent portion of the first element; and
  - a manually engageable member slidably supported upon said first element for movement lengthwise thereof into and out of a position of engagement with said end portion of the second element, whereby said end portion of said second element is urged toward said casing between said second and third points thereon and the second element is pressed tightly against said casing.
2. A pocket clip assembly for supporting an article upon a garment, comprising:
  - a rigid body member for the article, said body member having a side wall;
  - an elongated, relatively rigid outer element having a bowed portion between the ends thereof;
  - means rigidly securing one end of said outer element to said side wall so that said outer element extends along said side wall and its other end is urged toward engagement with said side wall, said outer element being relatively stiff near said one end thereof and relatively flexible near the other end thereof;
  - means defining an elongated, lengthwise slot in the flexible portion of said outer element;
  - an elongated and relatively flexible, inner element rigidly secured near one end to said side wall adjacent said one end of said outer element, said inner element extending lengthwise of said outer element between said article and said outer element, and said inner element having a central portion engaged with said side wall and having an end portion at the other end thereof engageable with and more flexible than said outer element adjacent said slot;
  - a button having a pin extending through said slot, said pin being movable lengthwise along said slot;
  - cam means on said pin between said elements, said cam means being movable with said button along said outer element into and out of engagement with said end portion of said inner element, whereby said end portion of said inner element is urged toward said side wall and said central portion of said inner element is pressed tightly against said side wall.

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