

PATENT SPECIFICATION

(11) 1371376

1371376

- (21) Application No. 45564/71 (22) Filed 30 Sept. 1971
 (31) Convention Application No. 76836 (32) Filed 30 Sept. 1970 in
 (33) United States of America (US)
 (44) Complete Specification published 23 Oct. 1974
 (51) International Classification H01M 1/02//G03B 17/02
 (52) Index at acceptance
 H1B D11C D12 D8N D9E
 G2A 401 457 LC
 (72) Inventors JEFFREY RICHARD STONEHAM and
 BENJAMIN BRISTOW ADAMS



(54) BATTERY FOR A PHOTOGRAPHIC CAMERA

(71) We, EASTMAN KODAK COMPANY, a Company organized under the Laws of the State of New Jersey, United States of America of 343 State Street, Rochester, New York 14650, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to electrical batteries, and in particular to holders for disc-like electrical cells for use in cameras.

An object of the present invention is the provision of a battery comprising a plurality of disc-like electrical cells juxtaposed in a compact manner in a holder.

According to the present invention there is provided a battery for a photographic camera comprising a plurality of disc-like electrical cells, the holder containing the cells being insertable into a camera, and having electrical contacts thereon arranged for engagement with corresponding contacts in the camera, and comprising at least first and second support means which hold the cells in a shingled arrangement.

With the battery as described, a much lower silhouette is obtained than if the cells were arranged coaxially, although a small amount is added to its length. Similarly, the battery may be much shorter than where the cells are in side by side relation but a small amount is added in silhouette. A significant and remarkable feature of this battery is that while it has greater volume than either of the prior arrangements, its shape and size enable it to fit easily into space limited housings similar to those found on cameras.

According to a preferred embodiment, the battery is a self contained package comprising a plurality of the cells potted in a moulded plastics material holder, the battery having externally accessible electrical contacts by means of which an electrical load can be put on the cells. With this construction the cells

are protected from physical damage and the camera from corrosion.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:—

Figs. 1 and 2 are diagrammatic representations respectively of a preferred and an extreme configuration of a battery according to the invention;

Fig. 3 is a pictorial view of a battery according to the invention;

Fig. 4 is an enlarged side view of the battery shown in Fig. 3 with a portion cut away to reveal the internal structure thereof; and

Fig. 5 is a partial cross-sectional view of a camera having a battery according to the invention installed therein.

Fig. 1 is provided to aid in an explanation of the invention in mathematical terms. Three electrical cells B are shown arranged in a shingled i.e. partially overlapping relationship as provided by the invention. It is assumed that the cells must be arranged to have in their aggregate a maximum dimension L which is less than the sum of their respective diameters D, and that the thickness T of a cell is less than D. One arrangement would be to stack the cells coaxially, in which case their aggregate maximum dimension would be either D or $3 \times T$. The object now is to see whether the cells can be arranged such as to reduce one dimension H of the battery to less than either D or $3T$ while allowing no dimension to exceed L.

Referring to Fig. 1, the foregoing comments can be expressed mathematically as follows:

$$L < 3D \quad 85$$

$$D > T.$$

The minimum dimension of the battery is H, and is defined by the relationship:

$$H = T \sin \theta + D \cos \theta$$

[Price 25p]

- where θ is the angle which the side of a cell makes with a horizontal datum line, the latter being defined by corresponding lowermost points on the cells (it follows that θ is also the angle which the top or bottom of a cell makes with a vertical line to the horizontal datum line). The angle θ is at its maximum value $\theta_{\max}$ when the cells are arranged as shown in Fig. 2. As diagrammatically indicated by the extreme case shown in Fig. 2:

$$\tan \theta_{\max} = D/T.$$

- Since D is greater than T , $\theta_{\max}$ is always greater than 45° , and has a value which increases as the ratio of D/T increases. When $D=3T$, $\theta_{\max}=71\frac{1}{2}^\circ$, for example. The angle $\theta_{\max}$ is less than 90° at all times for the cells to remain in a shingled arrangement. Hence,

$$45^\circ < \theta_{\max} < 90^\circ.$$

- Of course, the minimum value of θ ($\theta_{\min}$) is always greater than 0° when the cells are tilted.

- It was mentioned previously that one object of "shingling" the cells is to reduce their minimum dimension below the minimum dimension achieved when the batteries are stacked coaxially, i.e. the criteria for three cells is that:

$$H < 3T \text{ and while } L < 3D$$

- $H < D.$

Under the relationships set forth above that

$$\tan \theta_{\max} = \frac{D}{T}$$

$$\theta_{\min} > 0^\circ \text{ and}$$

$$D > T$$

- it necessarily follows that

$$T \cos \theta + D \sin \theta < 3D$$

$$T \sin \theta + D \cos \theta < 3T$$

$$T \sin \theta + D \cos \theta < D,$$

- and the object sought by the arrangement, as expressed by the foregoing criteria, is therefore met.

- The cells which were recently developed and to which reference was made earlier have a diameter to thickness ratio of approximately 3 (i.e. $D=3T$), and the value of H can be kept significantly below the minimum dimension achieved when the cells are stacked coaxially. Moreover, it is significant to note

that as the number of cells increases, the minimum dimension of the battery arrangement becomes increasingly less than the height of a stack of the batteries, and the advantage of the invention is increased.

Figs. 3 and 4 illustrate a battery holder according to a preferred embodiment of the invention, which is compact, easily used, and protective both to the cells held therein and to the camera adapted to receive it. The holder supports the cells in a shingled manner such that the longest dimension of the holder is less than the sum of the diameter of the respective cells, and the height or thickness of the holder is less than both the sum of the thicknesses of the cells and the diameter of any one cell. The battery holder is thus characterized by a low height, a short length, and a small bulk. The holder substantially encloses the battery to protect it against deterioration and abuse, while protecting the camera against damage from battery leakage. The cells are electrically connected in series, and the exposed end of one battery serves as a positive terminal for the battery, while an external terminal is electrically connected to the end of the opposite end cell to serve as the negative terminal.

Referring specifically to the drawings, Fig. 3 shows a battery holder 1, which may be of a moulded plastics material, which has a somewhat elongated configuration with an exposed cell at one end and a grooved, serrated end at the other. The compactness and simplicity of the holder are apparent from Fig. 3. For reference purposes, the respective walls of holder 1 are termed a top wall 2 and a bottom wall 3, these walls being slightly curved but generally flat.

Fig. 4 shows the interior of battery holder 1, the view being inverted with respect to Fig. 3. A plurality of cells 4 are supported by the inwardly facing portions of upper wall 2 and lower wall 3 of holder 1. Although holder 1 is shown containing three cells, the holder could be designed to hold any plurality of cells. Each cell has a disc-like configuration, and includes a cylindrical lower portion 5 defined by a side wall 6 and a bottom end wall 7, and a cap 9 defined by a side wall 10 and a top end wall 11. Cap 9 is coaxial with the base and has a diameter somewhat larger than that of lower portion 5.

In order to minimize the bulk of the holder for the cells, they are supported in a shingled manner as shown. Thus, the respective axes $L-L$ of the cells are mutually parallel, the cells are offset or staggered relative to each other, and they are tilted relative to top wall 2 and lower wall 3 of holder 1. Corresponding points on the cells 4, such as their uppermost points 15 and lowermost points 16 thus define lines parallel to walls 2 and 3.

In order to obtain the shingled effect, the cells are engaged on their respective side and

end walls to locate them as desired. Hence, recesses in the inwardly facing portion of lower wall 3 engage cell walls 6 and 7, and recesses in the inwardly facing portion of upper wall 2 engage cell walls 10 and 11. Other means of supporting the cells will occur to those skilled in the art. For example, appropriate posts can extend inwardly from the interior walls of the holder both to insulate the batteries from each other and to hold them in place. In the embodiment shown, the batteries are simply spaced from each other to attain the insulation effect.

The cells are electrically connected together by means of contacts 19 which may form support means and which are welded to the positive and negative poles of adjacent cells. The contacts can be advantageously prewelded to the cells prior to their assembly in the holder. An electrically conductive strip 21 is welded to cap 9 of one end cell, and extends to the exterior of holder 1 to serve as a negative external contact. The holder has an aperture 23 defined adjacent the lower portion of the other end cell for exposing a part of the lower end wall 7 thereof, the latter serving as the positive external contact. An electrical circuit can now be completed by connecting an electrical load across the two external contacts. An alternative external positive contact could comprise an electrically conductive strip welded to the positive pole of the last-mentioned cell and extending through a wall of the battery holder.

A battery holder according to the preceding discussion can be designed and manufactured as a self-contained unit. Thus, for example, a set of three cells with their respective contacts prewelded as explained above, can be moulded, or potted as inserts, together with a battery holder according to the invention. If the external contacts are both conductive strips, the cells are then entirely enclosed within the plastic holder and thus protected against deterioration and abuse. Moreover, the strips can be located in accordance with the receptacle with which the holder is adapted for use. Even if an opening is provided adjacent one of the cells whereby the latter serves as an external contact, the cells are protected. Furthermore, the foregoing holders reduce or eliminate the possibility of external contamination resulting from cell leakage by virtue of the containment of such leakage by the holder.

The holder on the other hand may be adapted to permit the insertion and removal of individual cells therefrom. For instance, the holder could comprise two separable sections which serve as a base and cover. The cover could be integral with the base, with a thin section connecting thicker base and cover portions, and acting as a hinge therefor.

A holder according to the invention substantially facilitates the insertion and

removal of a battery from a camera since the entire holder-battery package is handled as a unit. One receptacle in a camera for the previously described battery holder is shown in Fig. 5. Holder 1 is provided with serrations 25 so that the holder can be easily grasped. Holder 1 is additionally provided with a groove 27, by means of which the holder is retained in the camera receptacle, and a section 29 is tapered adjacent aperture 23 to assure the proper orientation of holder 1 prior to installation in the camera (as well as to reduce the size of the holder).

The receptacle for battery holder 1 comprises an entrance aperture 30, a rib 32 for entering groove 27, and a locating lug 34 for guiding holder 1 into place in the camera and for locating it therein. An electrical contact 36 in the form of a leaf spring is positioned for engagement with negative contact 21, and a similar contact 38 is positioned for engagement with base 7 which serves as a positive contact. Contacts 36 and 38 are connected to an electrical load in the camera such as an exposure control device or the like. A leaf spring 40 is provided for urging holder 1 into contact with rib 32, and the spring elements 36, 38 and 40 thus co-operatively hold battery holder 1 firmly in place. Holder 1 is installed in the camera by moving the tapered end 29 through entrance 30 and against contacts 38 and 40, and by moving it slightly upwardly so that rib 32 can enter groove 27. The foregoing operation is reversed to remove the holder from the receptacle.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A battery for a photographic camera comprising a plurality of disc-like electrical cells, the holder containing the cells being insertable into a camera, and having electrical contacts thereon arranged for engagement with corresponding contacts in the camera, and comprising at least first and second support means which hold the cells in a shingled arrangement.

2. A battery according to Claim 1 wherein the support means includes means for holding the cells in a spaced shingled arrangement and for electrically interconnecting the cells.

3. A battery as claimed in Claim 1 or 2 wherein the holder further comprises a portion defining a generally flat surface, and the support means serves for holding the cells in a parallel offset relationship to each other and in a tilted relationship with the generally flat surface, with corresponding points of each

end walls to locate them as desired. Hence, recesses in the inwardly facing portion of lower wall 3 engage cell walls 6 and 7, and recesses in the inwardly facing portion of upper wall 2 engage cell walls 10 and 11. Other means of supporting the cells will occur to those skilled in the art. For example, appropriate posts can extend inwardly from the interior walls of the holder both to insulate the batteries from each other and to hold them in place. In the embodiment shown, the batteries are simply spaced from each other to attain the insulation effect.

The cells are electrically connected together by means of contacts 19 which may form support means and which are welded to the positive and negative poles of adjacent cells. The contacts can be advantageously prewelded to the cells prior to their assembly in the holder. An electrically conductive strip 21 is welded to cap 9 of one end cell, and extends to the exterior of holder 1 to serve as a negative external contact. The holder has an aperture 23 defined adjacent the lower portion of the other end cell for exposing a part of the lower end wall 7 thereof, the latter serving as the positive external contact. An electrical circuit can now be completed by connecting an electrical load across the two external contacts. An alternative external positive contact could comprise an electrically conductive strip welded to the positive pole of the last-mentioned cell and extending through a wall of the battery holder.

A battery holder according to the preceding discussion can be designed and manufactured as a self-contained unit. Thus, for example, a set of three cells with their respective contacts prewelded as explained above, can be moulded, or potted as inserts, together with a battery holder according to the invention. If the external contacts are both conductive strips, the cells are then entirely enclosed within the plastic holder and thus protected against deterioration and abuse. Moreover, the strips can be located in accordance with the receptacle with which the holder is adapted for use. Even if an opening is provided adjacent one of the cells whereby the latter serves as an external contact, the cells are protected. Furthermore, the foregoing holders reduce or eliminate the possibility of external contamination resulting from cell leakage by virtue of the containment of such leakage by the holder.

The holder on the other hand may be adapted to permit the insertion and removal of individual cells therefrom. For instance, the holder could comprise two separable sections which serve as a base and cover. The cover could be integral with the base, with a thin section connecting thicker base and cover portions, and acting as a hinge therefor.

A holder according to the invention substantially facilitates the insertion and

removal of a battery from a camera since the entire holder-battery package is handled as a unit. One receptacle in a camera for the previously described battery holder is shown in Fig. 5. Holder 1 is provided with serrations 25 so that the holder can be easily grasped. Holder 1 is additionally provided with a groove 27, by means of which the holder is retained in the camera receptacle, and a section 29 is tapered adjacent aperture 23 to assure the proper orientation of holder 1 prior to installation in the camera (as well as to reduce the size of the holder).

The receptacle for battery holder 1 comprises an entrance aperture 30, a rib 32 for entering groove 27, and a locating lug 34 for guiding holder 1 into place in the camera and for locating it therein. An electrical contact 36 in the form of a leaf spring is positioned for engagement with negative contact 21, and a similar contact 38 is positioned for engagement with base 7 which serves as a positive contact. Contacts 36 and 38 are connected to an electrical load in the camera such as an exposure control device or the like. A leaf spring 40 is provided for urging holder 1 into contact with rib 32, and the spring elements 36, 38 and 40 thus cooperatively hold battery holder 1 firmly in place. Holder 1 is installed in the camera by moving the tapered end 29 through entrance 30 and against contacts 38 and 40, and by moving it slightly upwardly so that rib 32 can enter groove 27. The foregoing operation is reversed to remove the holder from the receptacle.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A battery for a photographic camera comprising a plurality of disc-like electrical cells, the holder containing the cells being insertable into a camera, and having electrical contacts thereon arranged for engagement with corresponding contacts in the camera, and comprising at least first and second support means which hold the cells in a shingled arrangement.

2. A battery according to Claim 1 wherein the support means includes means for holding the cells in a spaced shingled arrangement and for electrically interconnecting the cells.

3. A battery as claimed in Claim 1 or 2 wherein the holder further comprises a portion defining a generally flat surface, and the support means serves for holding the cells in a parallel offset relationship to each other and in a tilted relationship with the generally flat surface, with corresponding points of each



of the cells defining lines parallel with the surface.

4. A battery as claimed in Claim 3 wherein the portion comprises a lower portion of the holder, the uppermost parts of each of the cells lying in a plane parallel with the generally flat surface, there being an upper portion of the holder for cooperating with the lower portion to maintain the position of the cells in the holder.

5. A battery as claimed in any preceding Claim wherein the holder comprises electrically conductive means engageable by the cells and forming the or one of the electrical contacts.

6. A battery as claimed in any preceding Claim wherein the holder is made of moulded

plastics material and the cells are moulded in the material.

7. A battery as claimed in any preceding Claim further including external serrations on the holder for facilitating manual grasping thereof.

8. A battery as claimed in any preceding Claim of tapered form at a prescribed portion for facilitating the insertion of the battery into a camera.

9. A battery comprising a holder for a plurality of disc-like cells substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

L. A. TRANGMAR, B.Sc., C.P.A.
Agent for the Applicants

Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1974.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



* C L M S *