Inventors:
Sanford J. Zemel
Paul B. Davis
by
Their Attorney
FLASHTUBE GETTER ELECTRODE
Sanford J. Zeme, Mayfield Heights, and Paul B. Davis, South Euclid, Ohio, assignors to General Electric Company, a corporation of New York.
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ABSTRACT OF THE DISCLOSURE
A getter flag for use in a flashtube comprises a metal strip folded over into a U-shape and containing barium getter material in a cup-like depression stamped into one side of the strip. The tungsten inlead projects through a hole punched in the closed end of the U, and the strip is secured to the inlead by spot welds at the open end. It may be used as anode in repetitive flashtubes, and also as cathode in flashtubes for intermittent photographic use.

BACKGROUND OF THE INVENTION
The invention relates to getter flags or electrodes especially adapted for use in photographic flashtubes operating with cold cathodes.
Photographic flashtubes comprise a small diameter glass tube, filled with a rare gas such as xenon, and having a cathode and an anode sealed into opposite ends between which an electric arc discharge in the gas takes place. In photographic applications, the flashtube is fired intermittently by means of a portable power pack and gives a high-intensity flash of very short duration as the picture is being taken. A cold cathode is used, that is one which receives no heating except as a result of the discharge when it occurs. A desirable quality in a flashtube is that it operates at low voltage; this increases the reliability of the unit particularly when batteries in the power pack become weak. It is also desirable to eliminate sputtering and deterioration of the electrode in order to increase the life of the flashtube and reduce end blackening.

It is conventional to use a so-called barium getter tab in a flashtube as a cathode in such manner as to be heated by the discharge. The barium absorbs both residual hydrogen and oxygen and thereby interrupts the water cycle which causes early end blackening. The getter tab must be heated by the discharge when used as a cathode, and in that case it is attached to the cathode lead. When used as a getter only, the tab may be located anywhere within the tube but is usually attached to the anode lead as a matter of convenience. In flashtubes which are flashed intermittently only and not repetitively, the getter tab has been used as the cathode. One such getter tab is described and claimed for instance in U.S. Pat. 2,913,615—Davis and comprises a double-sided nickel screen covering a U-shaped nickel strip enclosing a rod-shaped body of activating and gettering material consisting of barium and aluminum compounds, the whole being covered over by a close-fitting nickel shield.

While the electrode getter tabs used in the past have been functionally satisfactory, they are relatively complicated and therefore expensive to produce. The object of the invention is to provide a simplified and more easily manufactured barium getter tab electrode for use in flashtubes.

SUMMARY OF THE INVENTION
In accordance with our invention, the new getter tab electrode comprises a metal strip commonly referred to as a flag in which the barium getter material is pressed into a cup-like depression stamped into the strip. The strip consists of metal having a melting point of 1000° C. or better, suitably nickel. It is formed into a U-shape and has a hole punched into the bottom or closed end of the U. The tab is mounted on a tungsten inlead by threading the inner end of the lead through the hole in the closed end of the U and making spot welds at the open ends of the U to secure them to the lead. The tip of the tungsten lead extending beyond the getter tab in the direction of the opposite electrode serves as an anchor point for the discharge and prevents envelope blackening by vaporization of metal from the tab.

When used in a repetitive flash source where the discharge occurs more than 4 times per minute, as in a blinder signal where the discharge occurs 80 to 90 times per minute, the getter tab must be connected as anode. In such case its sole function is to getter gaseous impurities within the flashtube and a more emissive cathode pellet, for example a porous tungsten sponge containing barium compounds, is used for the cathode. One suitable barium compound is barium aluminate, another is barium oxide achieved by heat-decomposing position of the carbonate. In flashtubes intended for intermittent photographic use, the getter tab electrode of the invention may be used as cathode in which case it serves the dual function of gettering gaseous impurities and emitting electrons to initiate and sustain the discharge.

DESCRIPTION OF DRAWING
FIG. 1 is a side view of a spiral type flashtube in which the getter tab of the invention serves as anode.
FIGS. 2a, b and c are respectively front elevation, side elevation and end views of the getter tab inlead assembly.
FIG. 3 is a plan view of the nickel strip of the getter tab laid out flat.
FIG. 4 is a side view of a linear type flashtube in which the getter tab of the invention is used as cathode.
The flash tubes of FIGS. 1 and 4 are drawn to the same scale, which may be gauged from the 4th overall length of the linear flashtube including inleads in FIG. 4. The parts shown in FIGS. 2 and 3 are drawn to twice the scale of FIGS. 1 and 4.

DESCRIPTION OF PREFERRED EMBODIMENT
Referring to FIG. 1, the illustrated lamp or flashtube comprises a tubular glass envelope 1 twisted into a 1½ turn spiral or helix. The ends of the tube are closed hermetically sealed and have extending therethrough in lead wires 2, 3 which have secured to their inner ends an anode 4 and cathode 5 respectively. The cathode pellet 5 may consist of porous tungsten sponge admixed with barium aluminate according to U.S. Pat. 2,957,231—Davis et al. The porous tungsten retards the diffusion and evaporation of barium and makes the cathode suitable for operation at the higher temperatures encountered in repetitive flashtubes. The tube is filled with an ionizable gas, suitably xenon at about 600 torr. An external starting electrode is provided to which a pulse is applied to initiate a discharge through the tube. As here illustrated, the starting electrode comprises a fine wire 6 spiralled around the envelope 1 and connected at both ends to a metal band 7 which encircles the ends of the tube and thereby serves also as a brace. An auxiliary metal band 8 welded to the mid-point of band 7 provides additional bracing and also gives a direct connection to the mid-point of starting wire 6. In some flashtubes, the starting wire 6 is replaced by a transparent conductive coating on the flashtube envelope to which connection is made through the auxiliary metal band 8.
In the illustrated lamp, the getter tab electrode of the invention is connected as anode, as indicated by the positive polarity sign. Referring to FIG. 2a to c, the tab is shown mounted on inlead assembly 2 prior to the sealing
thereof into an end of the flashtube envelope. The inlead comprises an outer section 2a of nickel and an inner section 2b of tungsten butt welded together at 2c. A bead 2d of intermediate tungsten sealing glass on the tungsten section permits sealing to the borosilicate glass of the flashtube envelope. The tab itself comprises a metal strip 11, suitably of nickel, molybdenum, tantalum or other refractory metal having a melting point of 1000° or better. Nickel is preferred because it is least expensive. In FIG. 3, the tab is shown laid out flat prior to folding over. The barium getter material 12 consisting of barium and aluminum compounds sintered together is pressed into a cup-like depression 13 stamped into one side of the nickel strip. The strip has a hole at its center which becomes located in the closed end of the U when the strip is doubled over. The tab is mounted on the inlead by threading the end of the tungsten inner lead through the hole 14, bending the tab over on both sides as shown in FIG. 2, and spot welding both open ends of the U to the tungsten inlead as indicated at 15, 15'.

The simplicity and ease of assembly of the new design according to the invention are apparent. In use as anode in a repetitive flashtube as illustrated in FIG. 1, the getter tab electrode of the invention is just as effective as the relatively complex structure previously used and at the same time is more economical to make and requires less labor to assemble into a flashtube. The flashtube of FIG. 1 corresponds to the one designated commercially FT-152 having a 125 watt-second rating.

FIG. 4 illustrates a linear flashtube in which the getter tab electrode of the invention is used as cathode, as indicated by the negative polarity sign. The flashtube comprises a straight tubular glass envelope 21 the ends of which are closed and hermetically sealed and having therethrough inleads 22, 23. The filling is xenon at 300 torr. On the inner end of inlead 22, the getter tab electrode 4 of the invention is mounted and functions as cathode. In this case the tab serves the dual function of gettering any gaseous impurities within the flashtube and emitting electrons to initiate and sustain the arc discharge. The inner end of inlead 23 functions directly as the anode.

What we claim as new and desire to secure by Letters Patent of the United States are:

1. A flashtube comprising an elongated vitreous envelope containing an ionizable gaseous medium and having inleads sealed into its ends, and a getter tab electrode attached to one of said inleads and comprising a thin strip of metal having a melting point of 1000° C. or better bent into a U-shape and having a hole in the closed end of the U, the inner end of the inlead being of tungsten and extending through said hole and the open ends of the U being spotwelded to the inlead, and a cup-like depression in one side of said strip containing sintered getter material comprising a barium compound.

2. A flashtube as defined in claim 1 wherein said getter tab is attached to the cathode inlead.

3. A flashtube as defined in claim 1 wherein said getter tab is attached to the anode inlead.

4. A flashtube as defined in claim 3 wherein a cathode pellet of porous tungsten sponge admixed with a barium compound is attached to the cathode inlead.

5. A flashtube as defined in claim 1 wherein the metal strip consists of nickel, molybdenum or tantalum.

References Cited

UNITED STATES PATENTS

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RAYMOND F. HOSSFELD, Examiner

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