March 5, 1968 J. EIDECKER 3,372,341

SPARK GAP FOR PROTECTING ELECTRONIC COMPONENTS

Filed May 7, 1965 2 Sheets-Sheet 1

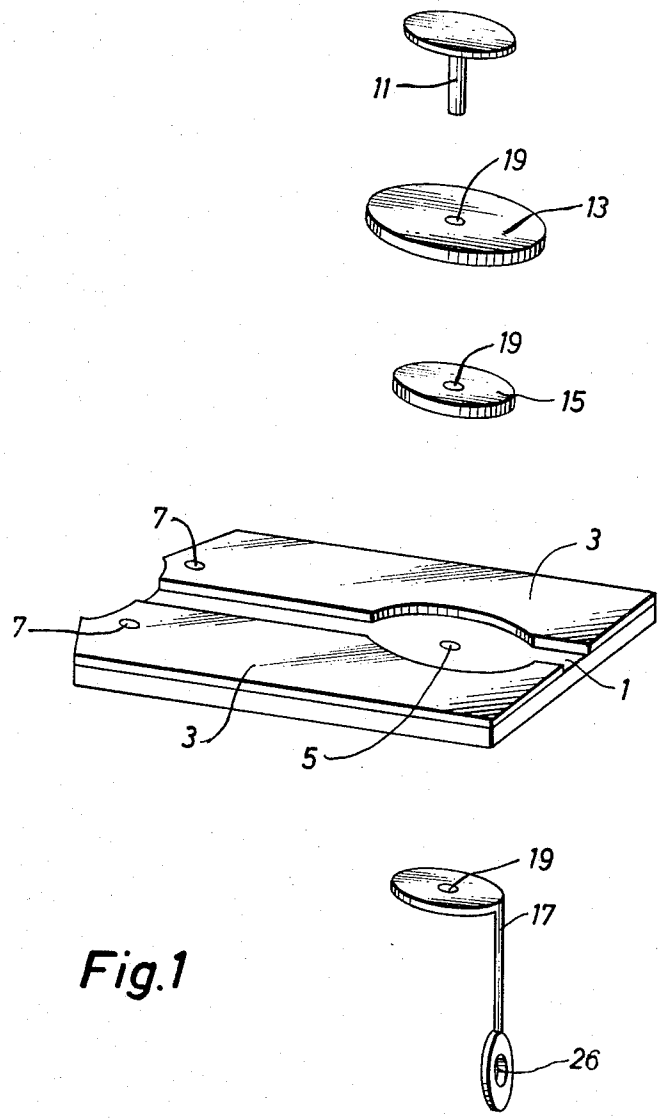


Fig.1

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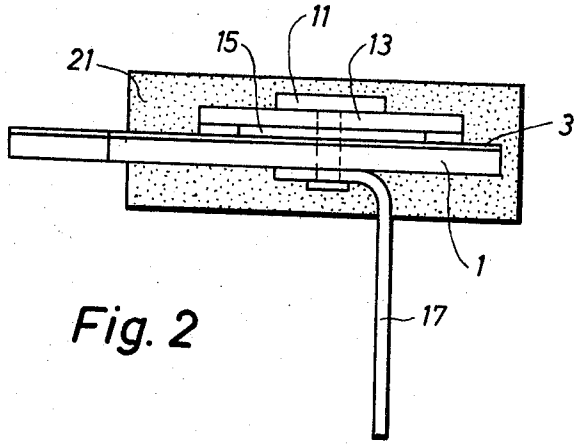


Fig. 2

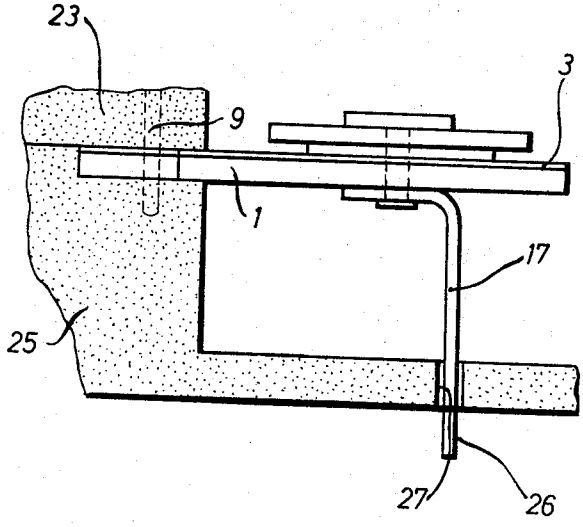


Fig. 3

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SPARK GAP FOR PROTECTING ELECTRONIC COMPONENTS

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4 Claims. (Cl. 328—8)

ABSTRACT OF THE DISCLOSURE

A spark gap apparatus for limiting the electrical potential applied to electronic components. A counter-electrode is precisely spaced from an electrode on a circuit board by an annular spacer. The edge of the counter-electrode extends beyond the spacer and defines a surface which overlies the electrode on the circuit board. Electric discharges will travel between the exposed surface of the counter-electrode and the adjacent surface of the electrode.

The invention relates to a spark gap for protecting electronic components against excess voltages, and in particular for cathode ray tubes.

The known spark gap devices suffer from a limitation in that they can be manufactured only at relatively high cost since it is difficult to connect the wire-shaped electrodes exactly at the desired distance from one another. However, a very accurate distance between electrodes is necessary since the ignition voltage of the spark gap must not fluctuate within wide limits. In addition, the danger exists, in the known spark gaps, that the voltage at which ignition begins increases after one or a few flash-overs since material disintegration at the electrodes increases the distance between the electrodes.

According to the invention at least two electrodes each having a large planar surface area are precisely spaced in parallel relationships one from the other. The large areas of the electrodes insures the maintenance of the precise distance between the electrodes after repeated flash-overs since material disintegration due to each flash-over is insignificant with respect to the total opposed area. A circuit board having one electrode thereon is spaced from a counter-electrode by a spacer disc. The edge of the counter-electrode extends beyond the edge of the spaces thereby defining a relatively large surface parallel to and in spaced relationship with the surface of the electrode. In addition the spark gap according to the invention is readily manufactured, since only a metallized or metallic electrode disc is riveted onto the printed circuit board with the interposition of a spacing disc. Finally, an advantage must be emphasized, the spark gap device according to the invention may comprise one, two or more flash-over gaps beside each other since it is not difficult to arrange a number of printed electrodes on the printed circuit plate opposite the metallized disc.

In order that the invention may readily be carried into effect, one embodiment thereof will now be described in greater detail, by way of example, with reference to the accompanying drawing, in which

FIG. 1 is an exploded view of the spark gap assembly according to the invention.

FIG. 2 shows a spark gap assembly according to FIG. 1 enclosed in an airtight manner,

FIG. 3 shows how the spark gap assembly according to the invention can be secured in the operating position.

The spark gap arrangement shown in FIG. 1 comprises a printed circuit board **1** on which two printed electrodes **3** are provided. The circuit board further comprises, between the electrodes **3**, an assembling aperture **5** and further apertures **7** through which connection pins **9** of a cathode ray tube can be passed. The printed wiring is partly removed or recessed around the assembling aperture **5** to ensure a safe distance between rivet **11** passed through the assembling aperture **5** and the printed wiring **3**. The spark gap according to FIGURE 1 further comprises a metallic counterelectrode **13**, a spacing disc **15** and a connection member **17**. The metal disc **13**, the spacing disc **15**, and the connection members **17**, as well as the printed circuit board **1**, are provided with assembling apertures **19**. The rivet **11** is passed through these assembling apertures **5** and **19** and then headed so that the components of the spark gap arrangement are rigidly secured together.

Since oxidation of the printed wiring **3**, which consists of copper, and the electrode disc **13**, can influence the initial ignition voltage of the spark gap, the electrode **3** and the disc **13** may be coated with a known material to prevent oxidation.

FIGURE 2 shows the assembled spark gap device. The parts containing the spark flash-over gap itself is embedded in an envelope **21** which seals the spark gap in an airtight manner. The envelope **21** may consist, for example, of polyvinylchloride.

FIGURE 3 shows a spark gap device according to the invention in combination with a television receiver. Apertures **7** of the printed circuit board (FIG. 1) received pins **9** of a cathode ray tube the latter of which is to be protected against excess voltages. The printed circuit board **1** is configured so that it can be clamped between the cap **23** of the cathode ray tube in question and the associated cathode ray tube holder **25**. In this case it is not necessary that a conductive connection be provided between the cap pins **9** and the circuit board **1**, since small distance influences have little effect on ignition. Thus, the spark gap need not be soldered in the circuit including pins **9**. Additional connections are not required either since an additional support is already available in that the soldering lug **26** of the arrangement extends through an aperture **27** in the holder of the cathode ray tube.

What is claimed is:

1. A spark gap apparatus for limiting the electric potential applied to electric components comprising: a circuit board having one electrode thereon, a spacer disc adjacent to said electrode, a disc-shaped counter-electrode concentric with and overlying said spacer, the edges of counter-electrode extending beyond the edge of said spacer disc to define a surface in overlying parallel spaced relationship with the surface of said one electrode, and means for interconnecting said circuit board, spacer disc, and counter-electrode.

2. A spark gap apparatus for limiting the electric potential applied to electronic components according to claim **1** wherein said means for uniting said counter electrode means, circuit board and spacing means comprises a rivet passing through an aperture in said circuit board remote from said one electrode.

3. A spark gap apparatus for limiting the electric potential applied to electronic components according to claim

1 wherein each said electrode and counter electrode comprises a film of conducting material.

4. A spark gap apparatus for limiting the electric potential applied to electronic components according to claim 1 wherein said counter electrode means comprises a disk of conducting material.

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