

M. H. SHAMOS
GEIGER-MÜLLER COUNTER

Filed July 23, 1948

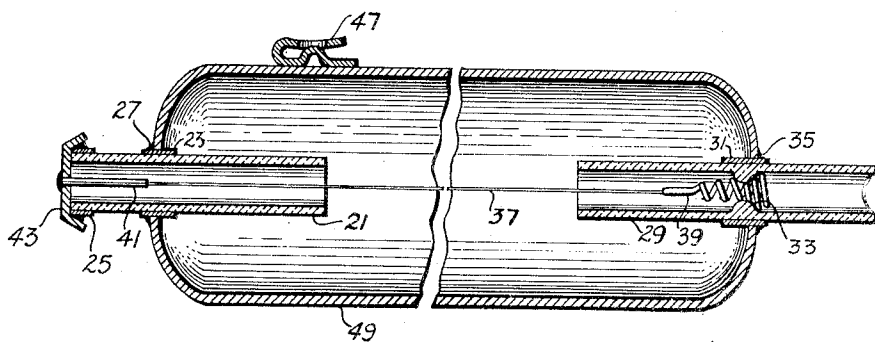


FIG. 2

INVENTOR.
MORRIS H. SHAMOS
BY *McHayer*
ATTORNEY

UNITED STATES PATENT OFFICE

2,522,902

GEIGER-MÜLLER COUNTER

Morris H. Shamos, New York, N. Y.

Application July 23, 1948, Serial No. 40,375

6 Claims. (Cl. 250—27.5)

1

This invention relates to improvements in metal Geiger-Müller counters.

Many cosmic-ray experiments require the construction of large quantities of metal Geiger-Müller counters. In fabricating such counters in the past, it has been the practice to make both ends of the central wire thereof accessible for flashing, and to insert an additional bushing for filling. Such counters are relatively expensive to manufacture, and of only fair mechanical strength and reliability.

The primary object of this invention is to provide a metal Geiger-Müller counter that is highly durable, reliable in performance, of good mechanical strength, and of low cost of manufacture.

Further objects and advantages of this invention as well as its construction, arrangement and operation will be apparent from the following description and claims in connection with the accompanying drawing, in which:

Fig. 1 is a sectional elevation of a metal Geiger-Müller counter, showing a preferred embodiment of the invention; and

Fig. 2 is a sectional elevation of a modified form thereof.

Similar numerals refer to similar parts throughout the several views.

In the preferred embodiment shown in Fig. 1, cathode 11 is a length of copper or brass tubing that is acid-cleaned and polished on the inside with steel wool so as to eradicate the usual die scratches. A first end cap 13 is spun from flat stock to fit closely over one end of the cathode 11, and is sealed thereto by soft solder 15. A hole is drilled through the center of said end cap 13 to receive the first bushing hereinafter described. A second end cap 17 is likewise spun from flat stock to fit closely over the other end of the cathode 11, and is sealed thereto by soft solder 19. A hole is drilled through the center of said end cap 17 to receive the second bushing hereinafter described.

A first bushing 21, made of heavy-wall, low-expansion borosilicate glass tubing, known under the trade name "Pyrex" is provided with a first metallic band 23 deposited on said bushing intermediate the ends thereof and a second metallic band 25 deposited on said bushing at an end thereof. Bushing 21 is inserted into the hole in end cap 13, positioned co-axially with cathode 11, and secured in that position by means of a soft solder seal 27 binding end cap 13 to metallic band 23. Thus, bushing 21 extends into the cathode, thereby forming a protective sleeve over an end of the central wire hereinafter described.

2

A second bushing 29, likewise made of heavy-wall Pyrex tubing, is provided with a metallic band 31 deposited on said bushing intermediate the ends thereof, at which point the bushing is also provided with an interior constriction 33 adapted to seat the spring hereinafter described. Bushing 29 is inserted into the hole in end cap 17, positioned co-axially with cathode 11, and secured in that position by means of a soft solder seal 35 binding end cap 17 to metallic band 31. Thus, bushing 29 extends into the cathode, thereby forming a protective sleeve over an end of the central wire hereinafter described.

Central wire 37 is cut to desired length and one end is spot-welded to the apex end of conical and helical spring 39. The other end of said wire 37 is spot-welded to a short length of nickel wire 41. The wire assembly is then threaded through the bushings with the aid of a length of drill rod, with the nickel wire protruding through a small clearance hole in the center of a grid cap 43, which is soldered to metallic band 25 while the spring 39 is held in tension against the constriction 33 of bushing 29. A drop of solder is employed to seal said wire 41 to cap 43. Electrical connecting posts comprise said grid cap 43 and a Fahnestock clip 47 soldered to cathode 11.

The counter is sealed to the filling system, after washing with solvents, by means of the bushing 29, which is sealed off after filling.

In the modified form of the device as shown in Fig. 2, cathode 49 is a length of copper or brass tubing that is acid-cleaned and polished on the inside with steel wool so as to eradicate the usual die scratches and then the ends of said cathode are spun down to a diameter substantially equal to the outside diameter of the bushings 21 and 29. The device is then assembled in the manner hereinabove described with the spun-down portions of the cathode 49 providing integral end caps in lieu of the separate end caps 13 and 17. The elimination of such separate end caps thus permits the omission of the step of sealing end caps to the cathode tube and has proved to be an advantageous simplification in counters of comparatively small diameter.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. A Geiger-Müller counter comprising a cathode, a pair of bushing tubes carried in axial align-

ment therewith, a plurality of metallic bands deposited on said bushings, selected bands being sealed to said cathode and a selected band being sealed to a grid cap mounted on one of said bushing tubes, a wire assembly carried by said bushings, and means to couple conductors to said grid cap and to said cathode.

2. A Geiger-Müller counter comprising a cathode, a first end cap sealed to one end of said cathode, a second end cap sealed to the other end of said cathode, a pair of bushing tubes carried by said end caps in axial alignment with said cathode, a plurality of metallic bands deposited on said bushings, selected bands being sealed to said end caps and a selected band being sealed to a grid cap mounted on one of said bushing tubes, a wire assembly carried by said bushings, and means to couple conductors to said grid cap and to said cathode.

3. A Geiger-Müller counter comprising a tubular cathode, a first end cap sealed to one end of said cathode, a second end cap sealed to the other end of said cathode, a first Pyrex bushing tube, provided with a first metallic band deposited thereon intermediate the ends of said bushing and a second metallic band deposited thereon at an end thereof, carried by said first end cap in axial alignment with said cathode with said first end cap sealed to said first band and a grid cap sealed to said second band, a second Pyrex bushing tube, provided with a metallic band deposited thereon intermediate the ends thereof having an interior constriction intermediate the ends thereof, carried by said second end cap in axial alignment with said cathode, with said second end cap sealed to the band of said second bushing, a wire assembly comprising a wire carrying a length of nickel wire at one end and a conical and helical spring at the other end, said assembly being secured tautly in said bushings with the base of said spring bearing against said constriction and the nickel wire secured to said grid cap, and means to couple conductors to said grid cap and to said cathode.

4. A Geiger-Müller counter comprising a tubular copper cathode, a first metal end cap soft-solder sealed to one end of said cathode, a second metal end cap soft-solder sealed to the other end of said cathode, a first heavy-wall Pyrex bushing tube, provided with a first metallic band deposited thereon intermediate the ends of said bushing and a second metallic band deposited thereon at an end thereof, carried by said first end cap in axial alignment with said cathode with said first end cap solder-sealed to said first band and a grid cap solder-sealed to said second band, a second heavy-wall Pyrex bushing tube, provided with a metallic band deposited thereon inter-

mediate the ends thereof and having an interior constriction intermediate the ends thereof, carried by said second end cap in axial alignment with said cathode, with said second end cap soft-solder sealed to the band of said second bushing, a wire assembly comprising a wire spot-welded at one end to a length of nickel wire and spot-welded at the other end to the apex of a conical and helical spring, said assembly being carried between said bushings with the spring thereof bearing against said constriction and the other end thereof secured to said grid cap, and means to couple conductors to said grid cap and to said cathode.

5. A Geiger-Müller counter comprising a tubular copper cathode having end portions spun down to a reduced diameter, a first heavy-wall Pyrex bushing tube, provided with a first metallic band deposited thereon intermediate the ends of said bushing and a second metallic band deposited thereon at an end thereof, carried at one end of said cathode in axial alignment therewith, said cathode being solder-sealed to said first band and a grid cap being solder-sealed to said second band, a second heavy-wall Pyrex bushing tube, provided with a metallic band deposited thereon intermediate the ends thereof and having an interior constriction intermediate the ends thereof, carried at the other end of said cathode in axial alignment therewith with said cathode solder-sealed to the band of said second bushing, a wire assembly comprising a wire spot-welded at one end to a length of nickel wire and spot-welded at the other end to the apex of a conical and helical spring, said assembly being carried between said bushings with the spring thereof bearing against said constriction and the other end thereof secured to said grid cap, and means to couple conductors to said grid cap and to said cathode.

6. A Geiger-Müller counter comprising a cathode, a pair of bushing tubes, a plurality of metallic bands deposited on said bushings, means to secure selected bands to said cathode to carry said tubes in axial alignment with said cathode, another selected band being sealed to a grid cap mounted on one of said bushing tubes, a wire assembly carried by said bushings, and means to couple conductors to said grid cap and to said cathode.

MORRIS H. SHAMOS.

REFERENCES CITED

The following references are of record in the file of this patent:

Korff: *Electron and Nuclear Counters*, 1946, D. Van Nostrand Co., Inc., New York, pp. 124 and 129.