United States Patent [19]

Edwards et al.

[11] **3,928,781**

[45] **Dec. 23, 1975**

[54] **GASEOUS DISCHARGE DISPLAY PANEL INCLUDING PILOT ELECTRODES AND RADIOACTIVE WIRE**

[75] Inventors: **Roger Joseph Edwards,** Woodstock; **Barouyr Zareh Hairabedian,** Lake Katrine; **Neil Myron Poley,** Kingston, all of N.Y.

[73] Assignee: **International Business Machines Corporation,** Armonk, N.Y.

[22] Filed: **Sept. 3, 1974**

[21] Appl. No.: **502,268**

[52] **U.S. Cl.** **313/54;** 313/188; 313/198; 313/201

[51] **Int. Cl.²** **H01J 17/32;** H01J 61/54

[58] **Field of Search** 313/54, 188, 198, 201; 117/220; 29/191.6, 199

[56] **References Cited**

UNITED STATES PATENTS

1,840,055	1/1932	Rentschler	313/54 X
2,990,492	6/1961	Wellinger et al.	313/54
3,019,358	1/1962	Ohmart	313/54 X
3,499,167	3/1970	Baker et al.	313/188 X
3,609,658	9/1971	Soltan	313/188 X
3,684,909	8/1972	Caras	313/54

Primary Examiner—Palmer C. Demeo

Attorney, Agent, or Firm—C. E. Rohrer; W. N Barret, Jr.

[57] **ABSTRACT**

In a plasma display panel consisting of gas enclosed between adjacent insulating members, a light source is used to supply charged particles in the gas to permit firing of the gas when coordinate conductors identifying a site location are energized. The use of such pilot lamps facilitates ignition in firing with uniform selection and firing potentials within all sites of the display panel. To eliminate the difficulty in achieving firing during cold starts a radioactive source comprised of a copper wire electroplated with nickel 63 and overcoated with a protective coat of nickel is placed within the gas panel to provide a source of free electrons. The wire is held in place by friction against the inside walls of the panel. Since the wire emits only beta radiation, no radiation hazard exists externally to the panel.

4 Claims, 3 Drawing Figures

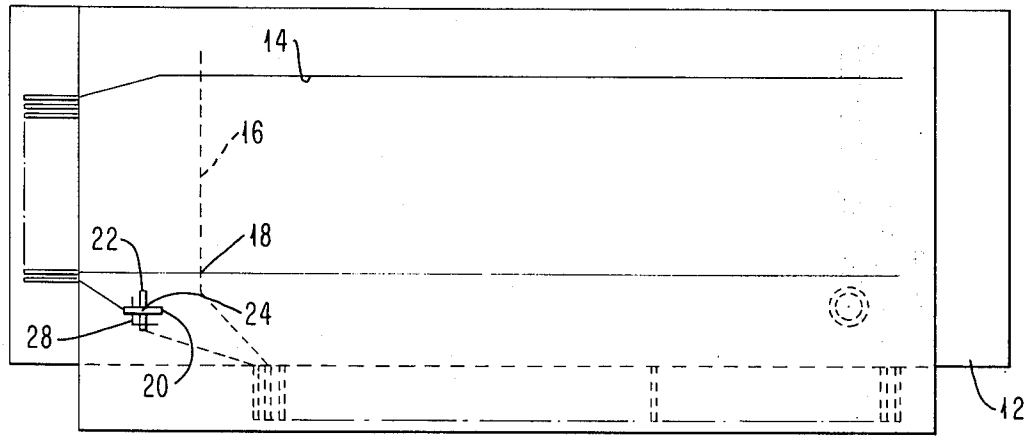


FIG. 1

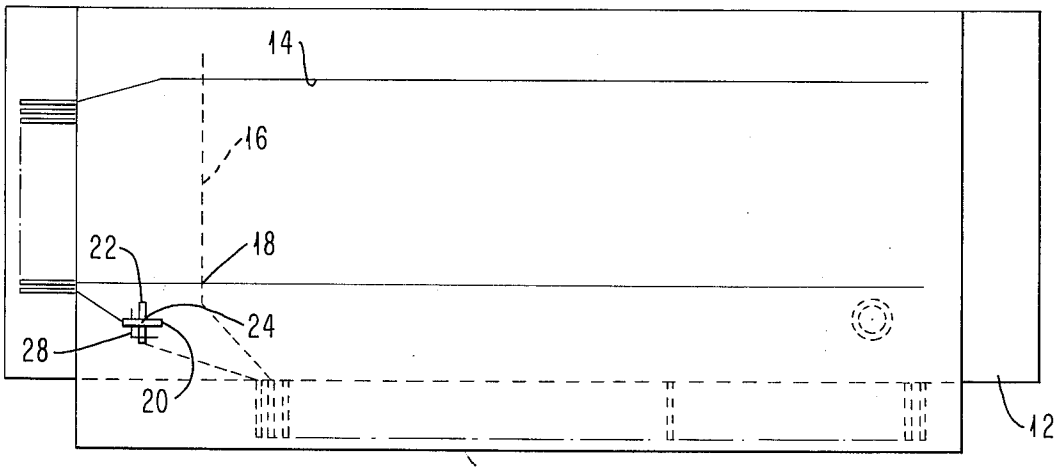
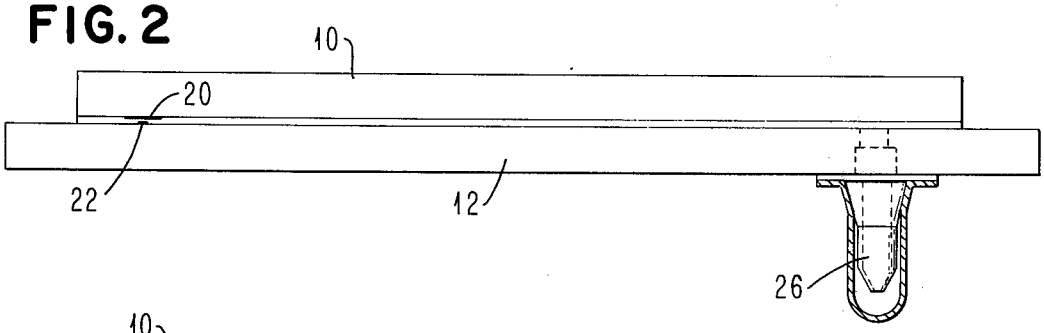


FIG. 2



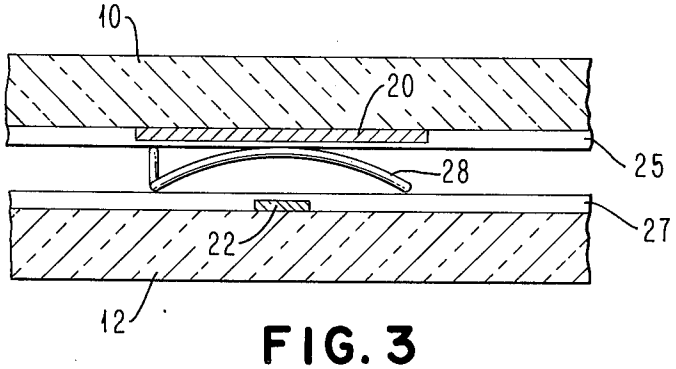


FIG. 3

GASEOUS DISCHARGE DISPLAY PANEL INCLUDING PILOT ELECTRODES AND RADIOACTIVE WIRE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to plasma display devices and more particularly to an improved means for firing the gas within said device.

2. Description of the Prior Art

The use of a light source as a pilot light for gas cells within a plasma display device is well known and is shown in U.S. Pat. No. 3,609,658 "Pilot Gas Cells For Gas Panels" Parviz Soltan, Sept. 28, 1971. The device disclosed in the Soltan patent employs a light source incident to the panel for the purpose of establishing a source of metastables, electrons and ions to permit uniform ignition within the panel cells. It utilizes auxiliary pairs of electrodes having an independent power supply which when discharged provides and maintains the light source. The gas panel has an inherent starting problem after it has not been ignited for a day or more. Furthermore, under normal lighting, photon and cosmic rays provide sufficient ionnization to fire the initial discharge by use of the pilot light. However, in the dark this process is attenuated sufficiently that cold starting is difficult.

Ultra-violet excitation or high voltage can be used to generate the free electrons necessary to allow ignition of the panel. This technique is not acceptable in a commercial product because of high cost and low reliability.

It is, therefore, an object of this invention to provide an inexpensive and reliable means of cold start ignition in a plasma display panel.

It is a further object of this invention to provide the proper quantity, form, material and placement of a radioactive source to provide a cold start within a gas panel with a minimum of hazard from stray radiation.

The above objects are accomplished in accordance with the invention by providing a radioactive source in the form of a copper wire electroplated with nickel **63** and overcoated with a protective coat of nickel. The wire is placed near the pilot lamp and emits beta radiation sufficient to facilitate initial firing of the pilot light when a drive signal is applied thereto.

The invention has the advantage that it assures a cold start within a short time. It has the further advantage that it is less costly than electronic start and more reliable.

The use of a small plated wire has the advantage that the wire can be introduced into the panel without changes in the manufacturing process.

Another advantage of the invention is that the radioactive wire is superior to radioactive gas utilized in the prior art because of the smaller concentrations which are necessary to achieve the same result. The wire will not contaminate the gas panel gas and there is no danger of radioactive leakage.

Furthermore, the nickel **63** in the form of a wire requires a lower quantity of radioactivity than a radioactive gas. Since nickel **63** is a weak beta emitter no radioactivity is present outside the gas panel.

Finally, the invention has the advantage that the use of friction to secure the nickel **63** wire to the sides of the gas panel chamber minimizes the manufacturing steps.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention as illustrated in the accompanying drawing:

FIG. **1** is a top view illustration of the preferred embodiment of the invention;

FIG. **2** is a side view of the embodiment shown in FIG. **1** and

FIG. **3** is a detailed view of the nickel plated wire shown in FIG. **1.**

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. **1** and **2** the gas panel structure is shown. Details which are not essential to the present invention have been omitted but may be ascertained from U.S. Pat. No. 3,609,658 cited above and from the articles and patents referred to in the text of said patent.

Transparent insulating members **10** and **12** (FIG. **2**) comprise opposite sides of a glass enclosed chamber. These sides have printed on them parallel orthoginal drive lines **14** and **16** (FIG. **1**). The members are sandwiched together such that the parallel lines **14** and **16** lie perpendicular to each other resulting in sites or celis at the intersection **18.**

In addition to the above electrodes, there are printed pilot electrodes **20** and **22.** The pilot electrodes intersect so as to form a pilot cell **24** at the intersection. The pilot cell is placed in close proximity to the display cells to provide a source of charged particles. A gaseous mixture is injected into the chamber during the manufacturing process by means of tube assembly **26** which in FIG. **2** has been shown to be sealed and capped. The pilot electrode pairs **20, 22** are connected to appropriate drivers which are not shown. This means that the pilot lamps may be continuously ignited to maintain conditioning which permits instantaneous operation of the display device.

Refer now to FIG. **3** which is an enlargement of a section of the gas panel taken at the pilot lamp electrodes **20** and **22** shown in FIG. **2.** In FIG. **3,** the insulating panels **10** and **12** are shown with electrodes **20** and **22** electroplated thereon. To protect the electrodes, the insulating panels **10** and **12** are covered with a further insulating layer **25** and **27.**

A small L-shaped radioactive wire **28** is shown between the insulating layers and placed near the pilot lamp to supply a source of free electron. The diameter of the wire is smaller than the distance between the insulating members **10** and **12.** Each leg of the wire has a slight spring to it so that it is held in place between the layers by spring tension.

The wire consists of oxygen-free high conductivity annealed copper wire electroplated with nickel **63** (radioactive strength of 1 ± 0.1 microcurie per centimeter) and overcoated with nickel 2500 ± 500 angstroms thick.

In summary, a gas panel has been shown which consists of a gaseous discharge medium sealed within a chamber which is enclosed by two flat insulating members which form the walls of the chamber. A pair of pilot electrodes is provided, one electrode deposited on one of said panels and the other electrode deposited on the other panel. A radioactive wire is placed in the

chamber within the vicinity of the electrodes for providing a source of free electrons for conditioning the gas panel for firing. The wire has a slight spring to it so that when it is placed within the chamber the wire is held in place between the walls of the chamber by friction.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In a plasma display device comprising a panel with an illuminable gas sealed in a chamber between two substantially transparent flat plates, said chamber containing a multiplicity of light emitting cells wherein each cell is formed at a crossover point of spaced orthogonal conductors, such that the gas in the region of each coordinate intersection of said conductors may be fired in response to a firing potential difference applied to said orthogonal conductors, the improvement comprising

a pair of pilot electrodes one of which is disposed on the interior surface of one of said flat plates, the other of which is placed on the interior surface of the other of said flat plates, and

a radioactive wire located within the chamber between the pilot electrodes,

whereby the radiation from said wire aids the ionization of gas in the region of said pilot electrodes which in turn aids in the ignition of the illuminable gas cells of the display panel.

2. The device of claim **1** wherein said wire is comprised of nickel **63.**

3. The device of claim **2** wherein said radioactive wire is of a diameter smaller than the chamber space between the pilot electrodes and wherein a holding means is provided to position said wire in said chamber.

4. The device of claim **3** wherein said holding means is comprised of a bow in the said radioactive wire, said wire in contact with each of the interior surfaces of said panel, said bow resulting in friction forces between said wire and each of said interior surfaces to hold said wire in position.

* * * * *