April 13, 1965 R. H. ALBRIGHT 3,178,697

PARALLEL OPERATION OF HIGH VOLTAGE INDICATORS

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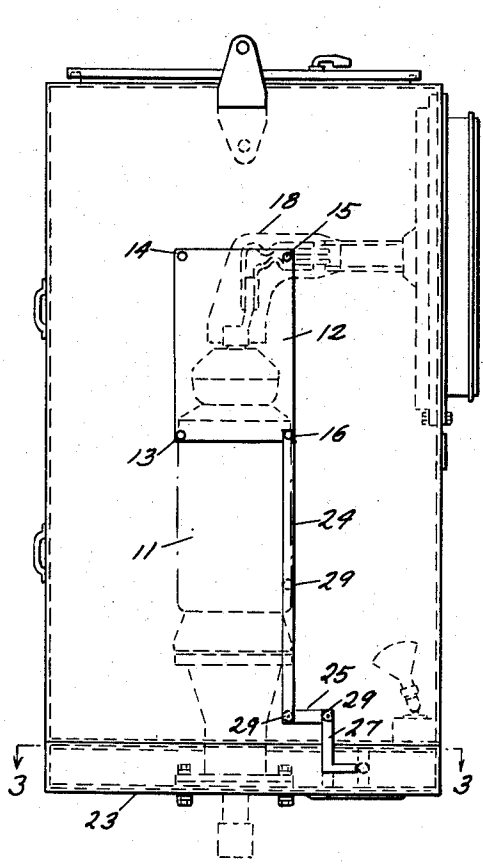


FIG. 2.

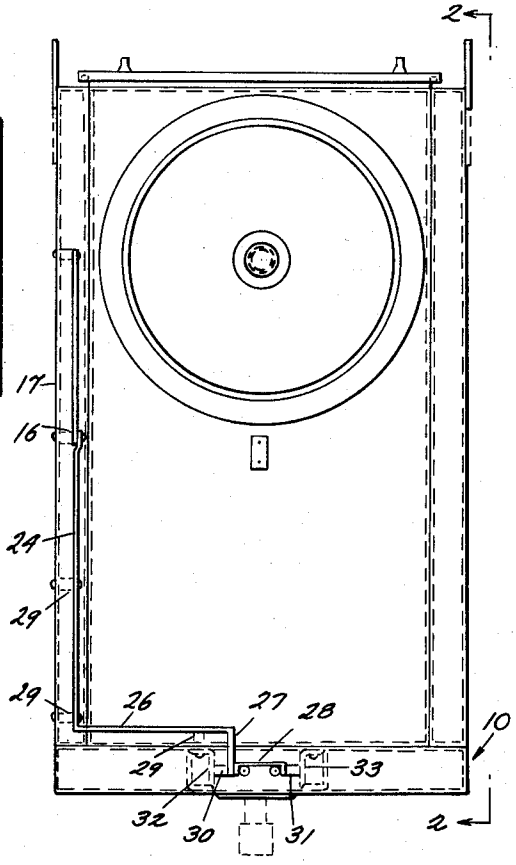


FIG. 1.

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FIG. 3.

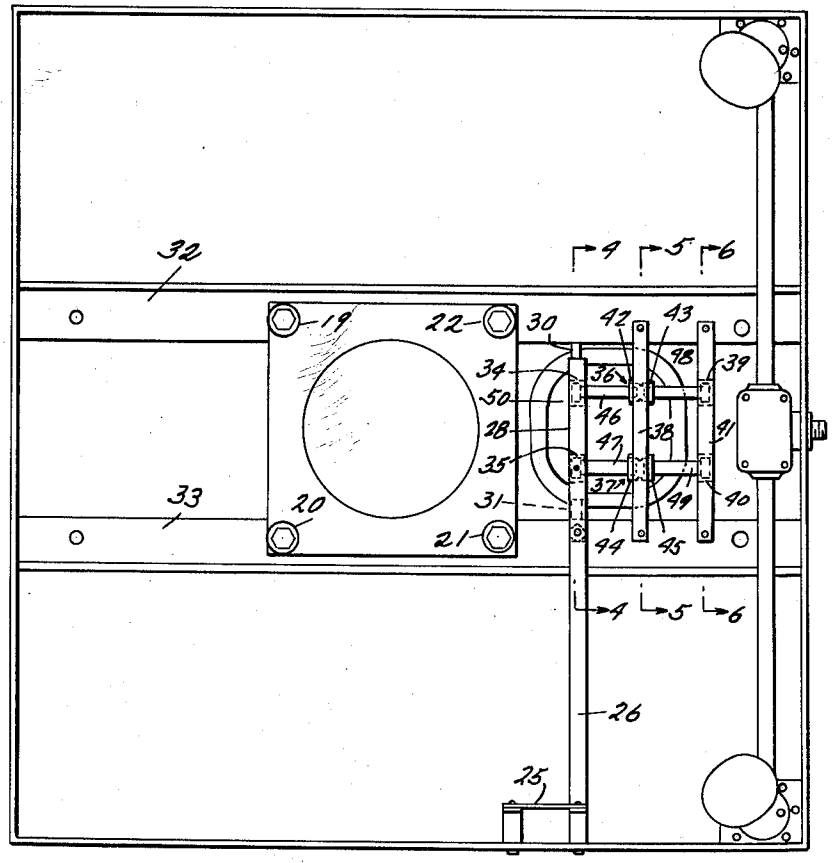


FIG. 4.

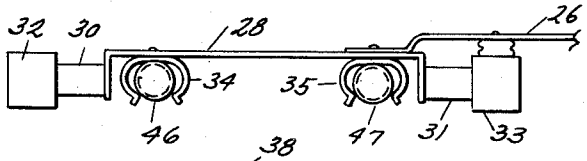


FIG. 5.

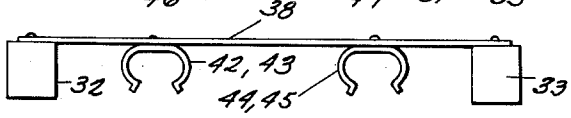
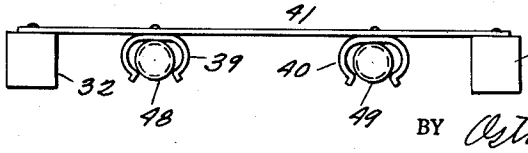


FIG. 6.



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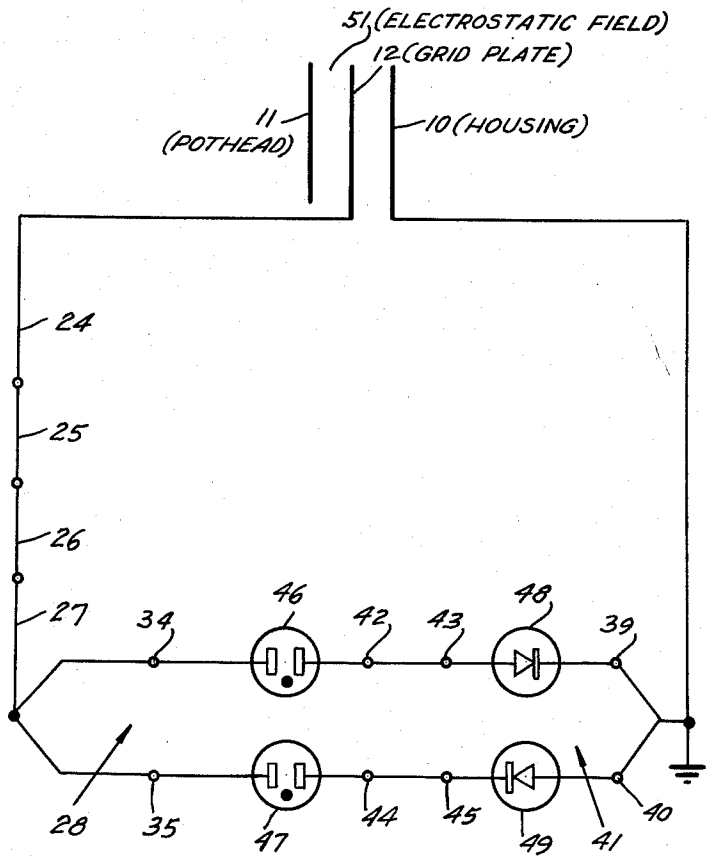


FIG. 7.

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United States Patent Office 3,178,697
Patented Apr. 13, 1965

3,178,697
PARALLEL OPERATION OF HIGH VOLTAGE INDICATORS

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Filed June 13, 1958, Ser. No. 741,758
6 Claims. (Cl. 340—248)

The instant invention relates generally to lamp type indicators and more particularly to an arrangement for operating high voltage indicators in parallel in a manner such that they will glow simultaneously.

Neon glow tubes are commonly used in high voltage electrical equipment as a means for indicating the presence of high potential. The usual arrangement for obtaining this high voltage indication consists of mounting the indicator means directly to the energized equipment. When so mounted, one end of the indicator means is secured to the equipment and the other end projects into space toward the equipment housing which is at ground potential.

With indicators mounted directly on energized equipment, if a tube fails to function it is difficult to replace. Further, indicator tubes propjecting toward ground make it difficult to meet certain dielectric specifications such as impulse level tests.

To overcome these difficulties, a grid comprising a metal sheet is mounted in the equipment housing between the equipment at high voltage and the housing. The grid is spaced sufficiently far from the inside of the housing so that a desired potential exists between the grid and the housing when the equipment is energized. The desired potential is sufficient to cause the indicators, when mounted between the grid and housing, to glow. With this arrangement, glow tubes can safely and readily be replaced after failure.

In order to make the glow tube readily viewable a lead is run from the grid to the vicinity of a window in the equipment housing and the glow tube is mounted just inside the window.

Quite often two glow tubes are connected in parallel so that if one tube goes bad the other will continue to indicate the presence of the high potential. This arrangement functions satisfactorily when the tubes are mounted directly to the equipment. However, when both tubes are connected to a single intermediate grid both tubes will not glow at the same time since as soon as one tube began to glow then sufficient current flows therethrough to drop the plate potential to a point where the second tube will not break down into a glow. Thus in the arrangement where only one of two tubes will glow at one time and both tubes cease to glow there exists an uncertainty as to whether there is an absence of high potential or a failure of both tubes. If both tubes glow simultaneously when potential is present, then when one tube fails it can immediately be replaced so that the subsequent failure of the other tube will not result in a false indication.

The instant invention provides an arrangement whereby parallel connected glow tubes may be operated from a single intermediate grid. This arrangement consists of placing a semi-conductor in series with each indicator tube. The semi-conductor in series with one indicator permits passage of current at alternate one-half cycle intervals while the semiconductor in series with the other

indicator is reversed so that current passes through it during the other alternate one-half cycle intervals. In this manner the indicator tubes operate independently, as if switches were alternately connecting the tubes to the grid, so that current through one tube does not cause the plate potential to drop while the other tube is preparing to fire. In this way both tubes will glow simultaneously.

Accordingly, a primary object of the instant invention is to provide a novel arrangement which permits high voltage indicators to be mounted at or near ground rather than on energized equipment.

Another object is to provide a novel arrangement whereby parallel glow tubes will glow simultaneously when connected to the same intermediate means.

A further object is to provide semi-conductor means in series with each of two indicator glow lamps thereby assuring that they will glow simultaneously.

These as well as other objects of the instant invention shall become readily apparent after reading the following indication of the accompanying drawings in which:

FIGURE 1 is a plan view of a high voltage pothead cubicle wherein my novel indicator means is incorporated.

FIGURE 2 is a side view of FIGURE 1 looking in the direction of arrows 2—2.

FIGURE 3 is a section taken through lines 3—3 of FIGURE 2 looking in the direction of the arrows 3—3.

FIGURES 4–6 are cross sections taken through lines 4—4, 5—5, and 6—6, respectively, of FIGURE 3 looking in the direction of the arrows.

FIGURE 7 is a schematic diagram of my invention.

Referring to the FIGURES 1–3 and 7 in particular, housing 10 provides an enclosure within which pothead 11 is disposed. Bolt means 19–22 rigidly secure pothead 11 to housing wall 23. Pothead 11 may be of the type manufactured by the G. & W. Electrical Specialty Company, designated by catalog #ATA–110 and rated at 92 k.v.

Metallic grid plate 12 is mounted on insulators 13–16 which is positioned in the vicinity intermediate the pothead 11 and the inside of wall 17 at the right angle bend 18 of pothead 11. The grid plate 12 is within the electrostatic field 51 of pothead 11 and is capacitively coupled to pothead 11 by virtue of that electrostatic field in the manner well known in the art. In the preferred embodiment of my invention, I have shown the grid as a plate. It is understood, however, that the electrically conducting means comprising the grid can be made of any conducting material, and may have any desirable configuration suitable for the particular installation. Aluminum bars 24–27, insulated from housing 10 by standoffs 29, electrically connect grid 12 to bus 28 which is mounted on insulator standoffs 30, 31 extending in opposite directions from ribs 32, 33 respectively secured to wall 23.

A first pair of fuse clips 34, 35 are mounted on bus 28 and a pair of fuse clip assemblies 36, 37 are mounted on insulating member 38 which is parallel to bus 28 and extends between ribs 32, 33. Each of the assemblies 36, 37 includes a pair of electrically connected fuse clips 42, 43 and 44, 45 respectively. A second pair of fuse clips 39, 40 are mounted on metallic member 41 which is parallel to insulating member 38 and is connected to ribs 32, 33 so as to be at the same electrical potential as housing 10 which is grounded.

Neon glow tube indicator lamps 46, 47 are mounted between bus 28 and insulator 38 with fuse clips 34 and

42 engaging the ferrules of lamp 46 and fuse clips 35 and 44 engaging the ferrules of lamp 47. Similarly rectifier assemblies 48, 49 extend between insulator 38 and bus 41 with fuse clips 43 and 39 engaging assembly 48 while fuse clips 45 and 40 engage assembly 49.

Each of the rectifier assemblies 48 and 49 comprises a semi-conductor diode, such as a Sylvania type 1N34, with the diodes of assemblies 48 and 49 being connected in reverse polarity directions as best shown in FIGURE 7. Thus glow tubes 46 and 47 are each connected in series with an individual diode and the series combinations are connected in parallel between the single grid 12 and housing 10 which is connected to ground. Grid 12 is positioned sufficiently close to pothead 11 so that tubes 46 and 47 will both glow when a predetermined A.C. potential is present.

The reverse polarity connection of the diodes enables each of the tubes 46 and 47 to glow on alternate half-cycles of voltage so that neither tube 46, 47 will reduce the potential at grid 12 to a point where the other tube will not fire. While I say and claim that both tubes 46, 47 will glow simultaneously this may not strictly speaking, be entirely accurate since current passes through each tube only during alternate half-cycles. However, for practical purposes the tubes 46, 47 glow simultaneously since their glows appear, to the eye, to be continuous.

It is to be noted that both glow tubes 46, 47 are positioned directly inside of window 50, which covers an opening in wall 23, so that tubes 46, 47 may conveniently be viewed. Should either tube require replacement, it is merely necessary to open window 50, remove the tube from its fuse clip retainers and insert a new tube therein.

Although I have here described a preferred embodiment of my novel invention, many variations and modifications will now be apparent to those skilled in the art, and I therefore prefer to be limited, not by the specific disclosure herein, but only by the appending claims.

I claim:

1. In combination an electrically conductive enclosure, a high A.C. voltage conductor positioned within said enclosure, an electrically conducting means disposed between said conductor and said enclosure in an electric field established when current flows through said conductor, and capacitively coupled thereto to be at a potential related in magnitude to said high A.C. conductor magnitude, an A.C. voltage indicating means having one end thereof electrically connected to said electrically conducting means and having the other end thereof electrically connected to said enclosure; said indicating means comprising a pair of parallel connected circuits each including an indicator and a semi-conductor means, said parallel circuits being energizable by the potential difference between said conducting means and said enclosure, each of said indicators comprising a glow tube.

2. In combination an electrically conductive enclosure, a high A.C. voltage conductor positioned within said enclosure, an electrically conducting means interposed between said conductor and said enclosure in an electric field established when current flows through said conductor, and capacitively coupled thereto to be at a potential related in magnitude to said high A.C. conductor magnitude, an A.C. voltage indicating means having one end thereof electrically connected to said electrically conducting means and having the other end thereof electrically connected to said enclosure; said indicating means comprising a pair of parallel connected circuits each including an indicator and a semi-conductor means, said parallel circuits being energizable by the potential difference between said conducting means and said enclosure, said semi-conductors being connected in reverse polarity directions so as to permit both of said indicators to simultaneously indicate the presence of a potential at said conductor.

3. In combination an electrically conductive enclosure, a high A.C. voltage conductor positioned within said enclosure, an electrically conducting means interposed between said conductor and said enclosure in an electric field established when current flows through said conductor, and capacitively coupled thereto to be at a potential related in magnitude to said high A.C. conductor magnitude, an A.C. voltage indicating means disposed within said enclosure and having one end thereof electrically connected to said electrically conducting means and having the other end thereof electrically connected to said enclosure; said indicating means comprising a pair of parallel connected circuits each including an indicator and a semi-conductor means, said parallel circuits being energizable by the potential difference between said conducting means and said enclosure, said semi-conductors being connected in reverse polarity directions so as to permit both of said indicators to simultaneously indicate the presence of a potential at said conductor; said enclosure having a transparent portion positioned at an externally accessible region thereof for convenient viewing of said indicators.

4. In combination an electrically conductive enclosure, a high A.C. voltage conductor positioned within said enclosure, an electrically conducting means interposed between said conductor and said enclosure in an electric field established when current flows through said conductor, and capacitively coupled thereto to be at a potential related in magnitude to said high A.C. conductor magnitude, an A.C. voltage indicating means disposed within said enclosure having one end thereof electrically connected to said electrically conducting means and having the other end thereof electrically connected to said enclosure; said indicating means comprising a pair of parallel connected circuits each including an indicator and a semi-conductor means, said parallel circuits being energizable by the potential difference between said conducting means and said enclosure, said semi-conductors being connected in reverse polarity directions so as to permit both of said indicators to simultaneously indicate the presence of a potential at said conductor; said enclosure having a transparent portion positioned at an externally accessible region thereof for convenient viewing of said indicators; said indicators being positioned adjacent said transparent portion and said electrically conducting means being operatively positioned remote of said transparent portion.

5. A high A.C. voltage indicator arrangement comprising a high A.C. voltage conductor; a first and a second circuit each including a visual indicator and a semi-conductor means connected in electrical series; said semi-conductor means of said first circuit being reversed in polarity with respect to said semi-conductor means of said second circuit; said first and said second circuit being connected to form a parallel combination whereby said indicators will simultaneously indicate the presence of a voltage exceeding a predetermined magnitude; an electrically conducting means; one end of said parallel combination electrically connected to said conducting means, said conducting means being capacitively coupled to said high A.C. voltage conductor to be at a potential related in magnitude thereto; said parallel combination having the other end thereof connected to ground potential.

6. In combination an electrically conductive enclosure, a high A.C. voltage conductor positioned within said enclosure, an electrically conducting means interposed between said conductor and said enclosure in an electric field established when current flows through said conductor, and capacitively coupled thereto to be at a potential related in magnitude to said high A.C. conductor magnitude, an A.C. voltage indicating means having one end thereof electrically connected to said electrically conducting means and having the other end thereof electrically connected to said enclosure; said indicating means comprising a pair of parallel connected circuits each including an indicator and a semi-conductor means, said parallel

circuits being energizable by the potential difference between said conducting means and said enclosure.

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