July 13, 1948. C. H. VAN ORDEN 2,445,012

LUMINOUS ELECTRICAL DISCHARGE DEVICE

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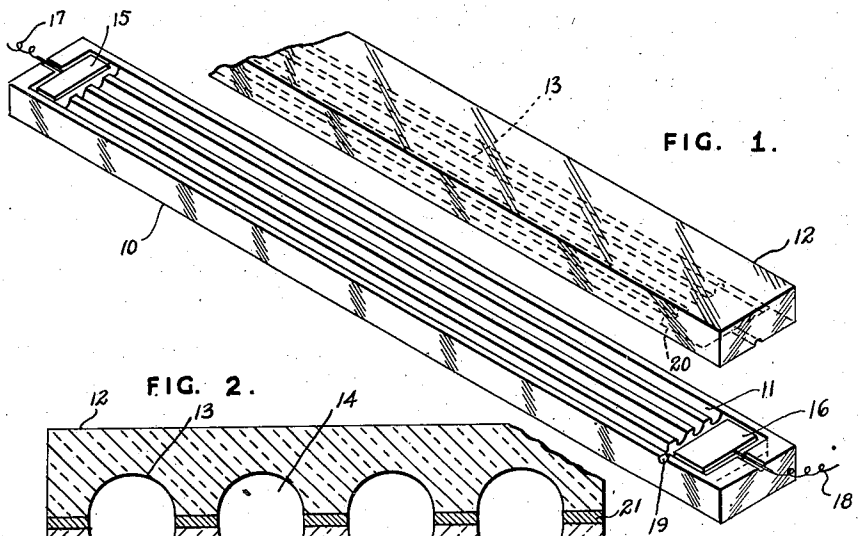


FIG. 1.

FIG. 2.

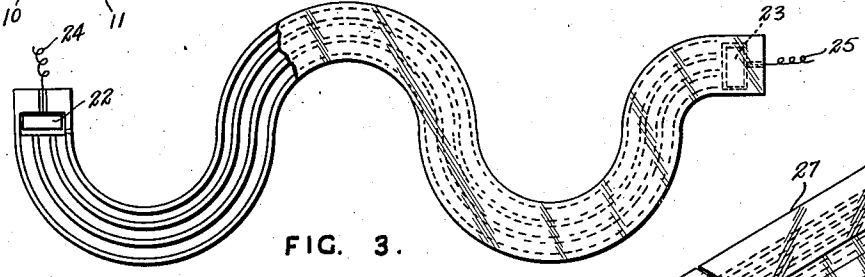


FIG. 3.

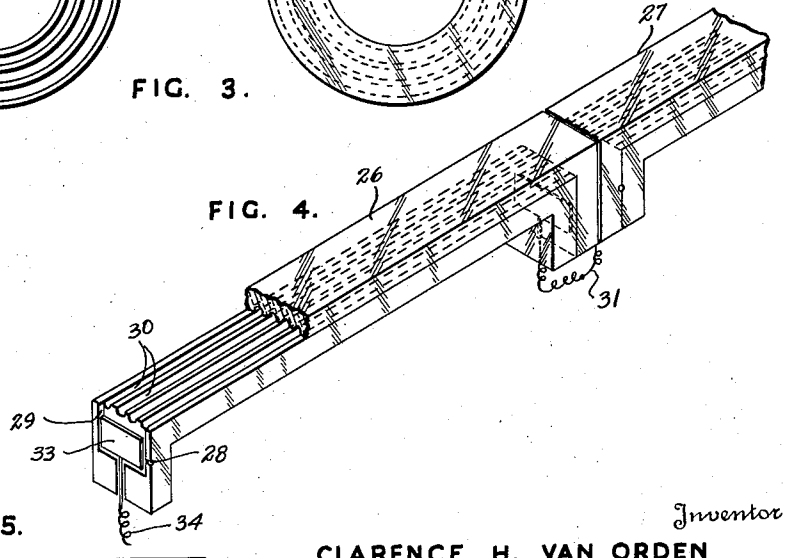


FIG. 4.

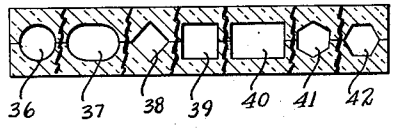


FIG. 5.

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FIG. 6.

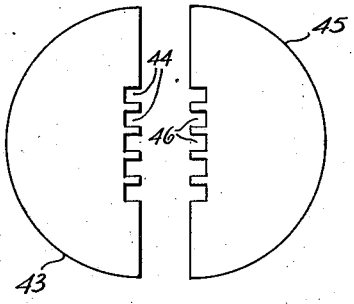


FIG. 7.

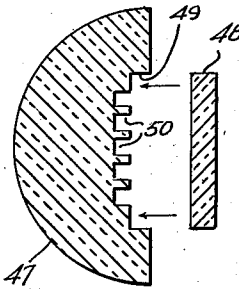


FIG. 8.

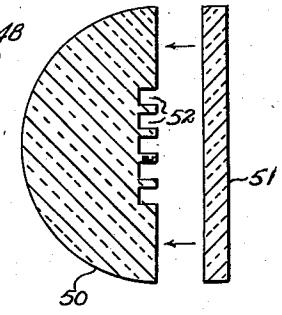


FIG. 9.

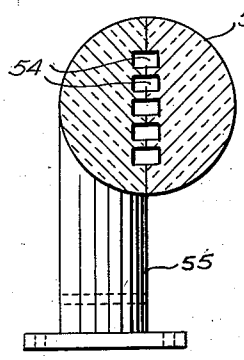


FIG. 10.

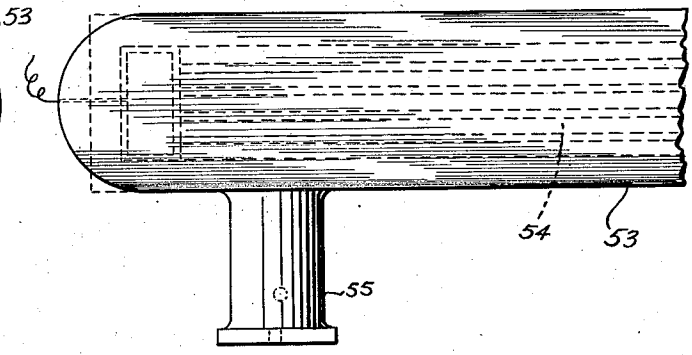
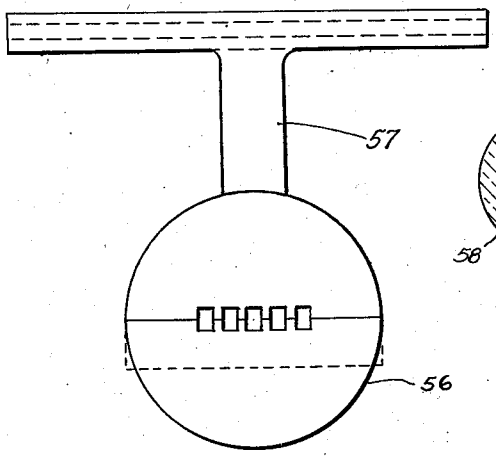


FIG. 11.



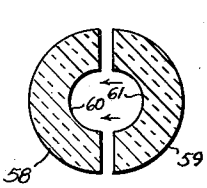


FIG. 12.

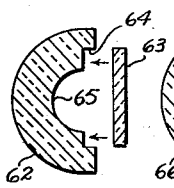


FIG. 13.

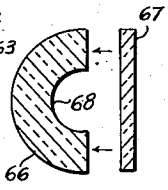


FIG. 14.

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2,445,012

LUMINOUS ELECTRICAL DISCHARGE DEVICE

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Application October 29, 1946, Serial No. 706,295

4 Claims. (Cl. 176—122)

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This invention relates to a luminous electrical discharge device.

The primary object of the present invention is to provide a luminous electrical discharge device having a closed gas chamber which is formed by securing together of at least two longitudinal sections of transparent dielectric material in face to face relationship, the inner face of at least one of the sections being provided along an intermediate portion of its length with one or more longitudinally extending channels defining in cooperation with the inner face of another section one or more gas receiving passageways.

Another object of the present invention is to provide a luminous electrical discharge device having a closed gas chamber which is formed by securing together of a pair of complemental longitudinal sections of transparent dielectric material in face to face relationship, the contiguous faces of the sections being provided along an intermediate portion of their length with one or more longitudinally extending channels registering with each other to form one or more hollow gas receiving passageways.

A further object of the present invention is to provide a luminous electrical discharge device having a closed gas chamber including one or more longitudinally extending hollow gas receiving passageways and having means for introducing a gas into said passageway or passageways.

A still further object of the present invention is to provide a luminous electrical discharge device which is simple and sturdy in construction, and highly efficient in operation.

Other objects and features of novelty will be apparent from the description taken in conjunction with the drawings in which:

Figure 1 is an exploded perspective view, with a part broken away, of the luminous device according to the present invention.

Figure 2 is an enlarged transverse sectional view with a part broken away, of the channeled sections of the closed gas chamber of the device of Figure 1, but in assembled relation.

Figure 3 is a front elevational view of a modified form of the luminous device of the present invention.

Figure 4 is a perspective view, with a part broken away and in section, of another form of the luminous device of the present invention.

Figure 5 is a transverse sectional view of another modification of the channeled sections comprising the closed gas chamber of the device of the present invention.

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Figure 6 is a transverse sectional view of another form of the channeled sections comprising the closed gas chamber of the luminous device, the dotted lines indicating the different configurations the respective sections may take.

Figure 7 is a transverse sectional view of another form of the channeled sections comprising the closed gas chamber of the luminous device.

Figure 8 is a transverse sectional view of still another form of the channeled sections comprising the closed gas chamber of the luminous device.

Figure 9 is an end elevational view, partly in section, of another form of the luminous device of the present invention.

Figure 10 is a front elevational view of the luminous device of Figure 9.

Figure 11 is a transverse sectional view of the luminous device of the form shown in Figures 9 and 10, suspendingly supported, the dotted lines indicating the different configurations the supports may take.

Figure 12 is a transverse sectional view of a further form of the channeled sections comprising the closed gas chamber of the luminous device.

Figure 13 is a transverse sectional view of a further form of the channeled sections comprising the closed gas chamber of the luminous device.

Figure 14 is a transverse sectional view of a still further form of the channeled sections comprising the closed gas chamber of the luminous device.

Referring to Figure 1, the numeral 10 designates a longitudinal section of transparent dielectric material, like glass, or similar plastic material, having on its inner face thereof a plurality of longitudinally extending channels 11, said channels being arranged along an intermediate portion of the length of said section and terminating short of the opposite ends thereof. Arranged in face to face relationship with respect to the longitudinal section 10 is a longitudinal section 12 made of like transparent dielectric material, said section being provided with a plurality of longitudinally extending channels 13, said channels being arranged along an intermediate portion of the length of the section 12 and terminating short of the opposite ends thereof. The longitudinally extending channels 11 of the section 10 define in cooperation with the longitudinally extending channels 13 on the inner face of the section 12 gas receiving passageways 14, as shown in Figure 2. Mounted on each

of the ends of the section 10 and carried thereby are electrodes 15 and 16 through which an electric potential is applied to the device, said electrodes being adapted to be connected for this purpose by means of wires 17 and 18 to a suitable high voltage source of electrical energy, such as for example, a transformer. The section 10 is provided with a transversely disposed groove 19 adjacent an end of the plurality of longitudinally extending channels 11, said groove extending from one side face of said section and terminating at a point adjacent the wall of the innermost channel. The section 12 is likewise provided with a complemental transversely disposed groove 20 adjacent an end of the plurality of longitudinally extending channels 13 and extending from one side face of said section and terminating at a point adjacent the wall of the innermost channel. The grooves 19 and 20, when channeled inner faces of the sections 10 and 12 are assembled in face to face relationship, register with each other to form an opening, said opening constituting the means for introducing a gas like a rare gas, into said passageways. The inner faces of the respective sections as thus assembled are not only secured together at their ends and along their longitudinal side edges to form a leak-proof unitary structure, but also as clearly illustrated in Figure 2, are secured together in their longitudinal regions of contact between the gas-receiving passageways 14 to thereby isolate said passageways transversely from each other and prevent diffusion of gas therebetween. This may be done by means of cement or by fusion, and as shown in Figure 2, the sections are secured together by means of a cement 21. It is to be noted that the sections may be cast and made of plain transparent dielectric material or made of such material which has been colored. The portion of the assembled sections defined by the gas receiving passageways constitute what is hereinafter termed a closed gas chamber. The passageways in such closed gas chamber are for the electrical discharge therethrough, such discharge taking a course which changes at frequent intervals, causing changing luminous lines to appear in the device.

The luminous device may be formed of a plurality of sectional units, Figure 3, each unit being formed of a pair of channeled longitudinally extending sections as above described in connection with Figures 1 and 2, but so shaped that when assembled in end to end relation they form a device providing a closed gas chamber having a plurality of tortuous passageways extending longitudinally therethrough. Mounted on each of the ends of the device are electrodes 22 and 23 which are adapted to be connected by means of wires 24 and 25 to a suitable high voltage source of electrical energy.

In Figure 4 there is shown a luminous device of the present invention wherein the device embodies a pair of units arranged in tandem relation, each unit being formed of a pair of complemental longitudinal sections of transparent dielectric material arranged in face to face relationship, the contiguous faces of the sections being provided along an intermediate portion of their length with the longitudinally extending channels registering with each other to form a closed gas chamber having a plurality of hollow gas receiving passageways extending therealong, but with the opposite ends of each section being turned inwardly at right angles with respect to the channeled portions thereof. In this device the means for introducing the gas into the passageways for each unit 26 and 27 takes the form of an opening 28 extending from one side of one of the right angled ends of the respective units into a cut out portion 29 forming a space which is in communication with the complemental ends of the longitudinally extending passageways 30. The electrodes carried by the abutting right angled ends of the tandem arranged units are connected together with a wire 31. The other right angled end of the unit 26 carries an electrode 33 which is adapted to be connected by means of a wire 34, to a high voltage source of electrical energy. The other right angled end of the unit 27, not shown, likewise carries an electrode and wire for connection to the source of electrical energy.

As shown in Figure 5, the closed gas chamber of the luminous device comprises a plurality of longitudinally extending passageways arranged in juxtaposed relation, each of the passageways being formed of a pair of longitudinal sections of transparent dielectric material secured together in face to face relationship, the contiguous faces of each of said sections being provided with a single longitudinally extending channel in registry with each other to form a single hollow passageway. In this figure, the closed gas chamber includes passageways 36, 37, 38, 39, 40, 41, and 42, arranged in juxtaposed relation, each of such passageways being of a different shape and of a different cross sectional area.

In Figure 6, the closed gas chamber of the luminous device comprises a longitudinal section 43 of the shape shown in such figure and having an inner face provided with a plurality of longitudinally extending channels 44 of the same shape and size intermediate its opposite ends thereof, and a complemental longitudinal section 45 of the shape of either that shown in full lines or of the shapes shown in dotted lines and having an inner face provided with a plurality of longitudinally extending channels 46 of like shape and size as that of those of the channels 44 of the section 43. The sections 43 and 45 when assembled in such manner that the channeled face of the one section is in registry with the complemental channeled face of the other section and secured to each other there is formed a closed gas chamber having a plurality of longitudinally extending passageways therein of the same cross sectional area and shape.

Reverting to Figure 7, the closed gas chamber of the luminous electrical discharge device is formed by securing together two longitudinal sections 47 and 48 of transparent dielectric material in face to face relationship. The inner face of section 47 is provided, intermediate its central portion, with a countersink 49, said countersink having a plurality of longitudinally extending channels 50 therein. The inner face of section 48 complemental to the channeled face of section 47 is flat and is received within the countersink 49 and supported therein. When the flat inner face of section 48 is in registry within the countersink 49 of the inner face of section 47 there is formed a closed gas chamber having a plurality of longitudinally extending passageways therein.

In Figure 8, the closed gas chamber of the luminous device is formed by securing together two longitudinal sections 50 and 51 of transparent dielectric material in face to face relationship, but in this form the inner face of the section 50 is only provided with a plurality of longitudinally extending channels 52, while the com-

plemental inner face of the section 51 is flat. When the respective inner faces of the sections 50 and 51 are assembled in abutting relation there is formed a closed gas chamber having a plurality of longitudinally extending passageways therein.

As for Figures 9 and 10, such figures show a form of the luminous electrical discharge device wherein the closed gas chamber 53 is of circular shape and interiorly thereof are a plurality of longitudinally extending passageways 54, the said chamber being supported upon a pedestal 55. As clearly shown in Figure 9, the closed chamber 53 comprises a pair of longitudinal sections having the channeled faces thereof arranged in face to face relationship and secured together.

Figure 11 shows a form of the luminous electrical discharge device in which the closed gas chamber 56 is of the same structure as that of Figures 9 and 10, but having the device mounted in a suspended support 57 of a configuration shown in such figure.

As for Figures 12, 13 and 14, the closed gas chamber of the luminous device includes only a single longitudinally extending passageway. In Figure 12, the closed gas chamber is formed by securing together two longitudinal sections 58 and 59 of transparent dielectric material in face to face relationship. The inner face of section 58 is provided with a single longitudinally extending channel 60. The complemental inner face of section 59 is likewise provided with a single longitudinally extending channel 61. The sections 58 and 59 when assembled in such manner that the channeled face of section 58 is in registry with the complemental channeled face of section 59 and secured together there is formed a closed gas chamber having a single longitudinally extending passageway therein. In Figure 13, the closed gas chamber of the luminous electrical discharge device is formed by securing together two longitudinal sections 62 and 63 of transparent dielectric material in face to face relationship. The inner face of section 62 is provided intermediate its central portion with a countersink 64, said countersink having a single longitudinally extending channel 65 therein. The inner face of section 63 complemental to the channeled face of section 62 is flat and is received within the countersink 64 and supported therein. When the flat inner face of section 63 is in registry within the countersink 64 of the inner face of section 63 there is formed a closed gas chamber having a single longitudinally extending passageway therein. In Figure 14, the closed gas chamber of the luminous device is formed by securing together two longitudinal sections 66 and 67 of transparent dielectric material in face to face relationship, but in this form the inner face of section 66 is only provided with a single longitudinally extending channel 68, while the complemental inner face of the section 67 is flat. When the respective inner faces of the sections 66 and 67 are assembled in abutting relation there is formed a closed gas chamber having a single longitudinally extending passageway therein.

It will be understood that in the forms of the luminous device wherein the closed gas chamber includes a single longitudinally extending passageway, the application of the electrical potential thereto causes a constant glow of the single column of gas confined therein whereas in the forms of the luminous device which include a closed gas chamber having a plurality of longitudinally extending passageways the application of the electrical potential thereto causes an intermittent and sequential glow of the several columns of gas confined in the respective passageways.

I claim:

1. A luminous electrical discharge device having a closed low-pressure gas chamber comprising at least two longitudinal sections of transparent di-electric material secured together in face-to-face relationship, the inner face of at least one of said sections being provided with a channel adjacent each end and being provided along an intermediate portion of its length with at least two longitudinally-extending channels communicating at their ends with said end channels and defining in cooperation with the inner face of another section at least two gas-receiving passageways, the inner faces of said sections being sealed together in their longitudinal regions of contact between said passageways to isolate said passageways from each other and prevent diffusion of gas therebetween transversely of the gas chamber, and an electrode mounted in each of said end channels for applying an electrical potential to said device.

2. A luminous electrical discharge device having a closed low-pressure gas chamber comprising at least two longitudinal sections of transparent di-electric material secured together in face-to-face relationship, the inner face of at least one of said sections being provided with a channel adjacent each end and being provided along an intermediate portion of its length with at least two longitudinally-extending channels communicating at their ends with said end channels and defining in cooperation with the inner face of another section at least two gas-receiving passageways, the inner faces of said sections being sealed together in their longitudinal regions of contact between said passageways to isolate said passageways from each other and prevent the diffusion of gas therebetween transversely of the gas chamber, means on said chamber for introducing a gas into said passageways, and an electrode mounted in each of said end channels for applying an electrical potential to said device.

3. A luminous electrical discharge device having a closed low-pressure gas chamber comprising a pair of complemental longitudinal sections of transparent di-electric material secured together in face-to-face relationship, the inner face of at least one of said sections being provided with a channel adjacent each end, the contiguous faces of said sections being provided along an intermediate portion of their length with at least two longitudinally-extending channels communicating at their ends with said end channels and registering with each other to form at least two hollow gas-receiving passageways, the contiguous faces of said sections being sealed together in their longitudinal regions of contact between said passageways to isolate said passageways from each other and prevent diffusion of gas therebetween transversely of the gas chamber, and an electrode mounted in each of said end channels for applying an electrical potential to said device.

4. A luminous electrical discharge device having a closed low-pressure chamber comprising a pair of complemental longitudinal sections of transparent di-electric material secured together in face-to-face relationship, the inner face of

at least one of said sections being provided with a channel adjacent each end, the contiguous faces of said sections being provided along an intermediate portion of their length with at least two longitudinally-extending channels communicating at their ends with said end channels and registering with each other to form at least two hollow gas-receiving passageways, the contiguous faces of said sections being sealed together in their longitudinal regions of contact between said passageways to isolate said passageways from each other and prevent diffusion of gas therebetween transversely of the gas chamber, means on said chamber for introducing a gas into said passageways, and an electrode mounted in each

of said end channels for applying an electrical potential to said device.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,825,399	Hotchner	Sept. 29, 1931
1,843,148	Bastow	Feb. 2, 1932
1,961,735	Braun	June 5, 1934
2,008,782	Brady	July 23, 1935
2,216,220	Baker	Oct. 1, 1940
2,255,431	Marden	Sept. 9, 1941