

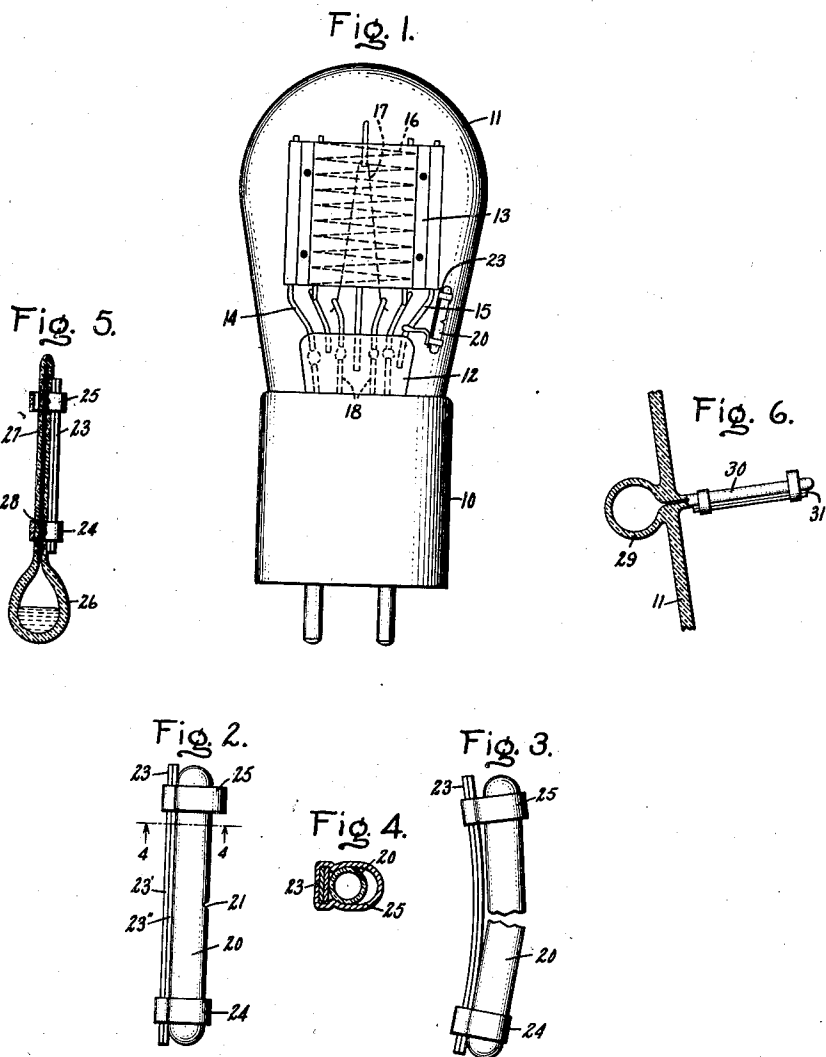
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A. J. KLING

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DISCHARGE DEVICE

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Inventor:
August J. Kling,
by *Harry E. Dunham*
His Attorney.

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DISCHARGE DEVICE

August J. Kling, Schenectady, N. Y., assignor to
General Electric Company, a corporation of
New York

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The present invention relates to improved means for introducing an active substance into a sealed discharge device at a particular time during the fabrication or use thereof.

Numerous methods have been proposed for introducing a substance such as a getter or photosensitive material into the interior of a discharge device after the same has been evacuated and sealed. Most of the known systems, however, function satisfactorily only when relatively small quantities of the active element are needed. It is one object of my present invention to provide an improved means which will serve with equal effectiveness whether large or small quantities are to be dealt with.

To this end the invention provides a substance-enclosing capsule or container which comprises a readily frangible wall portion. Temperature-responsive means, directly mechanically connected to the said wall portion, serve to deform and break the same when it is desired to liberate the contents of the container. It is a particular advantage of this combination that it is highly dependable and consistent in use so as to be well adapted to the requirements of mass production procedure.

The novel features which I desire to protect herein are pointed out with particularity in the appended claims. The invention itself together with further objects and advantages thereof may best be understood by reference to the following description taken in connection with the drawing in which Fig. 1 illustrates a discharge device suitably embodying the invention; Figs. 2 and 3 illustrate an important element of the embodiment of Fig. 1 in two conditions of use; Fig. 4 is a sectional view taken on line 4-4 of Fig. 2, and Figs. 5 and 6 illustrate modifications of the invention.

In the description which follows, the invention is discussed mainly as applied for the purpose of introducing a getter material into a vacuum tube. It should be understood, however, that it is considered to have equal application in any other situation where it is desired to introduce an active material into a sealed discharge envelope at some particular time during the fabrication or use of the envelope. One example of such a further use is the introduction into a photo tube of an electrode-sensitizing substance, such, for instance, as calcium. Another example consists in the introduction of a measured quantity of a gas such as argon or of a vaporizable ionizing material such as mercury or sodium into a device such as a discharge lamp or a gaseous rectifier.

Referring particularly to Fig. 1, there is shown a vacuum tube comprising a base portion 10 and a sealed evacuated envelope 11. The envelope is provided with a reentrant stem press 12 from which is supported appropriate electrode structure. In the case illustrated, this structure includes an anode or plate 13 which is supported from the press 12 by means of conductive stay-rods 14 and 15. Within the anode, which may consist, for example, of carbonized nickel, there are provided in concentric relation, a grid 16 and a cathode 17, these being shown in dotted outline. Lead-in connections 18, passing through the press 12, are provided for these various elements.

As is well known, in the fabrication of a device such as that illustrated, it is desirable after the discharge envelope is preliminarily evacuated and sealed, to introduce into the envelope a getter which acts to absorb or combine with occluded gases. In order that the getter may be brought into contact with the gaseous contents of the envelope only at the desired time, it is necessary that it be in the first instance isolated from the envelope interior. However, when the appropriate time arrives, some mechanism must be provided for eliminating the isolating means.

In the arrangement shown in Fig. 1, the isolating function is accomplished by means of a small container or capsule 20 which is mounted on the rod 15 in a position somewhat spaced from the electrode structure. This is adapted to enclose in sealed relation a suitable getter material. A getter of the type in question may comprise, for example, an alkaline earth metal, such as barium.

For the purposes of the present invention the capsule 20 is constituted of a readily frangible material, such, for example, as glass or quartz. Further, in order that the container may be readily broken, it may be provided with a cut or scratch such as is indicated at 21 (Fig. 2) so as to decrease the mechanical strength of the container wall.

As a positive means for breaking the capsule 20 when such breakage is desired, my invention provides a temperature responsive member which is operable upon the application of heat to exert a gradually increasing force upon the capsule 20 so as to deform the capsule sufficiently to fracture the same. The temperature responsive member referred to may comprise a thermostatic expansion element of known type, such for example, as a bimetallic strip 23. This is rigidly connected to the capsule 20 at one end by means of a clamping ring 24. At the other end, a "lost-motion

connection" or linkage is provided in the form of a metal loop 25 which is fixed to the expansible element 23, but which engages the capsule 20 only after a predetermined deflection of the element. It is the function of the lost motion connection to permit at least some heating of the expansion element 23 (e. g. during degassing of the electrodes) without causing fracture of the capsule 20. The character of this connection is illustrated most clearly in Fig. 4.

As is well known, an expansion element of the type referred to may be formed by combining two elements of different expansion characteristics. One mode of combination is illustrated in Fig. 2 wherein it appears that the element 23 includes two metal strips (numbered 23' and 23'' respectively) which are placed in face-to-face relation and joined rigidly throughout their length, as for instance, by brazing. One strip may comprise a low expansion substance such as Invar, and the other may consist of a high expansion substance such as brass. The particular substances selected will, of course, depend upon the conditions under which the device is to be used. In the use of the device described the electrode structure first is heated sufficiently to cause it to release occluded gases. Thereafter, the temperature responsive member 23 is heated, for example, by induction, to a temperature at which it is caused to undergo a marked lateral deflection. Under these circumstances, the loop 25 moves sufficiently to engage the capsule 20, thus causing its fracture at the weakened region 21. By this action the substances within the capsule are, of course, exposed to the interior of the discharge envelope and enabled to react with its contents.

It is not necessary in all cases that the entire body of the container from which the active substance is to be liberated be constituted of a frangible material. In Fig. 5 I have shown an alternative arrangement wherein only a portion of the container need be so constituted. In this case the container, indicated by the numeral 26, may be provided with a slender, normally sealed tubulation 27, which is readily breakable by virtue of its small dimensions. With this arrangement, only the part 27 needs to be connected to the temperature-responsive member (indicated at 28). It will be understood, of course, that breakage of the tubulation 27 by the action of this member will place whatever material is enclosed in the container 26 in communication with the interior of the discharge envelope.

A still further application of the invention is shown in Fig. 6 wherein the main body of the substance-enclosing container is arranged outside the discharge envelope as shown at 29. It is, however, adapted to communicate with the interior of the envelope through a frangible tubulation 30. This tubulation is normally closed but is provided with a temperature-responsive member 31 which functions when heated to fracture the tubulation.

It will also be understood that it is not essential to the purposes of the invention that the temperature-responsive element employed be of the bimetallic type. One may employ alternatively, for example, a deformable disk of the character frequently employed in heating appliances. Again, expansion means may be employed which depend on longitudinal rather than lateral expansion.

While I have described my invention in connection with particular structural embodiments

thereof, it will be understood that numerous modifications may be made by those skilled in the art without departing from the invention. I therefore aim in the appended claims to cover all such equivalent modifications as fall within the true spirit and scope of the foregoing disclosure.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. An electric discharge device including an envelope which encloses electrode structure, a supply of a substance desired to be introduced into the envelope at a particular time during the fabrication or use thereof, a container having a readily frangible wall part normally isolating the said substance from the interior of the envelope, a temperature responsive member which is deformable upon the application of heat, and a permanent mechanical connection between the said member and said frangible wall part effective upon deformation of the member to fracture the said wall part and thereby to place the said substance in communication with the envelope interior.

2. An electric discharge device including an envelope which encloses electrode structure, a sealed container within the envelope and enclosing a quantity of a substance which is desired to be introduced into the interior of the envelope at some particular time during its fabrication or use, at least a portion of the said container being of readily frangible construction, and a temperature-responsive member directly mechanically connected to the said container and operable upon the application of heat to deform the said frangible portion of the container sufficiently to fracture the same.

3. An electric discharge device including an envelope which encloses electrode structure, a capsule within the envelope enclosing a substance which is desired to be introduced into the interior of the envelope at some particular time during the fabrication or use of the discharge device, the said capsule having at least a portion thereof constituted of readily frangible material, a temperature responsive member which is deformable upon the application of heat, and a mechanical linkage providing a direct connection between the said member and the capsule and effective upon deformation of the member to cause breakage of the said frangible portion of the capsule.

4. An electric discharge device including an envelope which encloses electrode structure, a supply of a substance desired to be introduced into the envelope at a particular time during the fabrication or use thereof, a container having a readily frangible wall part normally isolating the said substance from the interior of the envelope, an elongated bimetallic expansion element adapted to deflect laterally upon the application of heat, and a mechanical connection between the said element and the said frangible wall part effective upon a predetermined deflection of the element to fracture the said wall part and thereby to place the said substance in communication with the envelope interior.

5. An electric discharge device including an envelope which encloses electrode structure, a supply of a substance desired to be introduced into the envelope at a particular time during the fabrication or use thereof, a container having a readily frangible wall part normally isolating the said substance from the interior of the envelope, a temperature-responsive member adapted to deform when heated and effective upon the occurrence of a predetermined deformation

thereof to fracture the said wall part of the container, and a lost motion connection between the said member and the said frangible wall part for permitting at least some deformation of the member without causing fracture of the wall part.

5 6. An electric discharge device including an envelope which encloses electrode structure, an elongated glass capsule within the envelope and enclosing a quantity of an active substance, the
10 said container being readily frangible upon the application of lateral force, and an elongated bimetallic element arranged adjacent to the said capsule and secured to the capsule at at least two
15 points along its length, the said element being adapted to deflect laterally when heated and thereby to apply sufficient force to the capsule to fracture the same.

20 7. An electric discharge device including an envelope which encloses electrode structure, a sealed container within the envelope enclosing a quantity of an active substance, said container comprising a bulbous portion and an elongated tubulation communicating with the bulbous por-

tion, the said tubulation being of such small dimension as to facilitate fracture thereof upon the application of lateral force, and a temperature-responsive device permanently mechanically connected to the tubulation and operable upon the application of heat to apply a gradually increasing force to the said tubulation to fracture the same.

8. An electric discharge device including an envelope which encloses electrode structure, a
10 container appended externally to the envelope, a supply of an active substance enclosed by the container, an elongated tubulation of small transverse dimensions extending between the said container and the interior of the envelope, the said
15 tubulation being normally sealed, and a temperature-responsive device directly mechanically connected to the said tubulation and effective upon the application of heat to apply a gradually increasing lateral force to the tubulation to fracture
20 the same.

AUGUST J. KLING.