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(54) Discharge lamp

Entladungsröhre

Tube à décharge

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EP 0 361 357 B1

Description

BACKGROUND OF THE INVENTION

This invention relates to a discharge tube, and more particularly to a discharge tube suitable for use with an ignition device with a series gap of an automobile engine or the like.

Generally, discharge tubes wherein gas is enclosed in a tube and a voltage is applied across a pair of electrodes provided at the opposite ends of the tube to cause a discharge between them are used widely in various fields.

Fig. 9 shows a discharge tube 61 which is used with an ignition device C with a series gap of an automobile engine shown in Fig. 10 or the like, and in the discharge tube 61, an electrode 63 in the form of a needle and another electrode 64 in the form of a flat plate are provided at the opposite ends of a cylindrical casing 62. Inert gas is enclosed in the discharge tube 61. And, the discharge tube 61 acts as a series gap S of the ignition device C, and as the discharge voltage at the series gap S is maintained high to some degree and the voltage across the series gap after discharging is applied to an electrode of an ignition plug P, an ignition voltage necessary for the ignition plug P is obtained without having a significant influence of an electric shunt circuit which may be caused by carbon sticking to the ignition plug P or the like.

However, since the electrode 63 of the discharge tube 61 on the side to which a voltage of an ignition coil 65 is applied is formed into a needle-like configuration as shown in Figs. 10 and 11 and as described hereinabove, there are problems that a non-uniform electric field is formed between the electrodes 63 and 64 of the discharge tube 61 and readily causes discharging and that the discharge voltage V_1 of a voltage characteristic illustrated in Fig. 12 does not present a very high level. Accordingly, in order to raise the discharge voltage V_1 of the discharge tube 61 to some degree, the distance between the needle-formed electrode 63 and the flat plate-formed electrode 64, that is, the series gap S, is increased to some degree. However, where the series gap S is increased in this manner, there is a problem that the configuration of the entire discharge tube is increased, and there is another problem that a discharge maintaining voltage V_2 of Fig. 12 becomes high and the energy loss during discharging is increased. Also, there is a problem that, since the electrode surface area of the needle-shaped electrode 63 is small, the influence of exhaustion of the electrode by discharging is great and the durability is not so long.

Thus, it may seem recommendable to form the electrodes of the discharge tube 61 as a pair of substantially parallel plate electrodes (Rogowsky electrodes) which are often used in experiments of a discharge phenomenon and wherein an end face has a flat face configuration and a circumferential edge portion around the end face is rounded into a curved face configuration in order to approximate an electric field between the electrodes of the discharge tube to a uniform electric field so as to cause a discharge less readily to allow the discharge voltage V_1 shown in Fig. 12 to be raised and also to reduce the distance between the electrodes to lower the discharge maintaining voltage V_2 to decrease the energy loss.

However, such Rogowsky electrode has a characteristic that it is readily influenced by a quantity of electrons floating between the electrodes and electrons are not discharged from the electrodes, and there is a problem that the discharge voltage V_1 is not stabilized and is influenced by a frequency of discharges.

A discharge tube according to the preamble part of claim 1 is known from EP-A-0 048 407.

It is an object of the present invention to provide a discharge tube which eliminates such problems of the prior art described above and wherein a high discharge voltage can be obtained with a comparatively small distance between electrodes and the discharge voltage obtained is stabilized.

This object is solved by discharge tubes having the features of claims 1 and 3.

A discharge tube of the type wherein a voltage is applied across a pair of electrodes to cause a discharge between the anode side electrode and the cathode side electrode is constituted such that substantially opposing end portions of the pair of electrodes are each formed into a non-acute configuration, and a large number of concave or convex portions are formed on a surface at least of the cathode side electrode.

Since the substantially opposing end portions of the pair of electrodes are each formed into a non-acute configuration, the electric field between the electrodes can be approximated to a uniform electric field, and since the large number of concave or convex portions are formed on the surface at least of the cathode side electrode, also an electric field microscopically approximated to a non-uniform electric field can be formed by the concave or convex portions.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view showing an embodiment of a discharge tube which does not fall in the scope of the claims.

Figs. 2A to 3B are sectional views showing embodiments according to the present invention;

Figs. 4 to 8 are sectional views showing other embodiments whereby the discharge tubes of Fig 4 to 7 do not fall in the scope of the claims.

Fig. 9 is a sectional view showing a conventional discharge tube;

Fig. 10 is a sectional view showing an ignition device with a series gap employing the discharge tube described above;

Fig. 11 is a circuit diagram of the ignition device with

a series gap; and

Fig. 12 is a view illustrating a voltage characteristic of a discharge tube.

DETAILED DESCRIPTION OF EMBODIMENTS

In the following, embodiment of a discharge tube according to the present invention will be described with reference to the drawings.

Fig. 1 shows a discharge tube 1. A casing 2 of the discharge tube 1 is formed as an insulating pipe in the form of a hollow cylinder made of a ceramics material such as, for example, an alumina ceramics material, a steatite material or a crystallized glass material. A screw thread 3 is formed over a longitudinal direction on an inner periphery of the casing 2, and a pair of electrode bases 4 made of a metal material are screwed into the casing 2 in such a manner as to close openings at the opposite ends of the casing 2. A pair of Rogowsky type electrodes 6 formed from a material suitable for discharging are provided in an opposing spaced relationship by a comparatively small distance on inner faces 4a of the individual electrode bases located in the casing 2 with metal rings 5 interposed therebetween.

Each of the Rogowsky type electrodes 6 is a kind of substantially flat single plate electrode member having such a non-acute end portion that an end face 6a thereof has a flat face configuration and a circumferential edge portion 6b around the end face 6a is rounded toward the metal ring 5 side into a curved face configuration, but the electrode 6 of the present invention further has a large number of small holes 7 formed therein. In forming the Rogowsky type electrode 6 having such holes, an etching step or a punching step may be applied to a thin plate of stainless steel having a thickness of, for example, 0.2 mm to form small holes 7 of a diameter of 0.1 to 0.8 mm at a hole pitch of 0.5 to 1.5 mm, and then the thin plate of stainless steel having the small holes 7 perforated therein may be shaped by press work.

Meanwhile, in mounting the Rogowsky type electrode 6 on the electrode base 4, a base end portion of the electrode 6 is fitted around a hub portion 4b provided projectingly on the inner face 4a of the electrode base, and then the metal ring 5 is force fitted on the electrode 6. Here, the electrode base 4 is preferably made of, for example, a 42 alloy material or a cover material having a coefficient of thermal expansion which is substantially equal to that of the casing 2 and is small in value while the metal ring 5 is preferably made of a material having a coefficient of thermal expansion which is substantially equal to or smaller than that of the electrode base 4.

Further, inert gas such as, for example, nitrogen gas is enclosed in an internal spacing 8 of the discharge tube 1, and a location between the casing 2 and each of the electrodes 4 is sealed with a sealing material 9 such as an epoxy type bonding agent, a glass type bonding agent or a brazing material by metallization so that the enclosed gas may not leak to the outside.

Thus, with the construction described above, since the pair of electrodes 6 of the discharge tube 1 are formed such that the electrode distance is made small as the Rogowsky type, the electric field between the electrodes 6 of the discharge tube 1 can be approximated to a uniform electric field, and the discharge tube is obtained which does not readily cause discharging and is low in discharge maintaining voltage V_2 and low in energy loss. Further, since the large number of small holes 7 are formed in each of the electrodes 6 of the discharge pipe 1 to attain a condition wherein a large number of irregularities such as concave or convex portions are formed on a surface of the electrode 6, an electric field microscopically approximated to a non-uniform electric field is formed by the small holes 7 and a condition is attained wherein electrons are discharged readily. Thus, the discharge tube is obtained wherein the discharge voltage V_1 is stabilized, which is a characteristic of a non-uniform electric field, and is not influenced by the frequency of discharges.

Meanwhile, since particularly the pair of electrodes 6 are formed as of the Rogowsky type, such a circumstance that, when a pair of parallel flat plates are disposed merely in an opposing relationship, an electric field is concentrated on a circumferential edge portion of each of the flat plates and has an undesirable influence on the discharge characteristic can be prevented, and discharging can be restricted so that it may take place only in a parallel electric field.

Further, since the casing 2 and the electrode bases 4 have substantially same coefficients of thermal expansion and the electrodes 6 formed from a material suitable for discharging are mounted on the electrode bases 4, the discharge tube 1 can be made with a strong structure against a heat cycle, and a sealing condition between the casing 2 and the electrodes 4 can be maintained to prevent leakage of inert gas enclosed in the tube.

Moreover, since the electrodes 6 are formed as a kind of parallel plate electrodes and have a greater surface area than conventional needle-formed electrodes, the influence of exhaustion of the electrodes by discharging is small and the durability is improved.

It is to be noted that, since in the discharge tube 1 described above, the pair of electrodes 6 disposed in an opposing relationship are both of the Rogowsky type having holes of the same configuration perforated therein, the discharge tube itself does not have a directivity that one of the electrodes serves as an anode and the other electrode serves as a cathode, and an impulse signal can be applied to either of the electrodes. Accordingly, the discharge tube 1 can be used also for an ac power source.

By the way, the discharge tube 1 having the electrodes 6 of the Rogowsky type described above was formed and various experiments were conducted. Such experiments revealed that stabilization of the discharge

voltage V_1 in the voltage characteristic of discharge shown in Fig. 10 depends upon a material and a shape of the cathode side electrode from which electrons are discharged, a distance between the electrodes, and a kind and a pressure of enclosed gas, and the magnitude of the discharge maintaining voltage V_2 depends upon conditions of the distance between the electrodes and enclosed gas.

Accordingly, it was made clear that, if at least the cathode side electrode is of the Rogowsky type having similar holes perforated therein as in the embodiment described above, then the configuration of the anode side electrode does not matter very much. Thus, an embodiment wherein the cathode side electrode is of the Rogowsky type having holes formed therein and only the anode side electrode is modified will be described below. It is to be noted that, since the structure of the cathode side electrode is the same as in the embodiment described above, description thereof is omitted herein.

Figs. 2A and 2B show discharge tubes in each of which an anode side electrode is formed into a flat plate configuration. In the case of the discharge tube 10 of Fig. 2A, an electrode 11 substantially in the form of a disk is provided on an electrode base 12 with a metal ring 5 interposed therebetween, and a large number of small holes 13 are formed in a surface of the electrode 11. The method of forming the small holes 13 is the same as the working method described in connection with the embodiment described above.

However, in the case of the present embodiment, the voltage characteristic obtained is substantially similar to that of the discharge tube 1 of the embodiment described above, and further since the anode side electrode 11 is changed from the Rogowsky type to the flat plate type, the length of a casing 14 in the longitudinal direction can be reduced, and the entire discharge tube 10 can be reduced in size. However, since the Rogowsky type electrode 6 serves as a cathode and the flat plate-formed electrode 11 not of the Rogowsky type serves as an anode, the discharge tube has a directivity and is not suitably used for an ac power source. This can be applied also to other embodiments hereinafter described.

To the contrary, in the case of the discharge tube 15 of Fig. 2B, an electrode base 17 serves also as an anode side electrode, and no small hole is formed in a surface of the electrode as distinct from Fig. 2A. However, since in this case the electrode base 17 serves also as an anode, the number of parts is reduced and the assembling facility is improved, but since the effective surface area of the electrode from which discharging takes place is reduced comparing with an electrode in which small holes are formed, the discharge tube is not suitably applied very much as a discharge tube which is to be used continuously due to an influence of exhaustion of the electrode by discharging.

It is to be noted that, in either of the embodiments described above, each of the anode side electrode bases 12 and 17 is screwed by way of a screw thread 18 or 19 formed on an inner periphery of the casing 14 or 16, and the screwed portion is sealed with a sealing material so that inert gas in the discharge tube 10 or 15 may not be leaked. Further, the coefficients of thermal expansion and so forth of the electrode bases 12 and 17 are made substantially equal to those of the individual casings 14 and 16.

Discharge tubes 20 and 21 of Figs. 3A and 3B correspond to the discharge tubes of Figs. 2A and 2B which are further reduced in size, respectively. In particular, screw threads 24 and 25 are formed on outer peripheries of one end portions of individual casings 22 and 23, and individual anode side electrode plates 26 and 27 formed substantially into lid-like configurations are fitted around and screwed over the casings by way of the screw threads in such a manner as to cover over individual cathode side electrodes. And, in the case of the discharge tube of Fig. 3A, a thin plate 28 having holes perforated therein is put between the anode side electrode plate 26 and an anode side end face of the casing 22.

Thus, according to the embodiments described above, the length of the casings in the longitudinal direction can be further reduced, and since the individual anode side electrode plates 26 and 27 cover also over part of the cathode side electrodes 6 fitted around the casings, the change in voltage characteristic by conditions in use is eliminated. Further, in the case of the discharge tube of Fig. 3A, since the thin plate 28 having the small holes perforated therein is present, the effective area of the electrodes from which discharge can take place is increased, and the influence of exhaustion of the electrodes is decreased.

While each of the embodiments described so far is constituted such that the electrode bases are screwed to the opposite open end portions of the discharge tube and the screwed portion is sealed with the sealing material, the means for sealing the opposite open end portions of the discharge tube is not limited to those of the embodiments described above. In the following, embodiments which employ some other sealing means will be described. It is to be noted that, in each of the following embodiments, a pair of electrodes are both of the Rogowsky type having holes formed therein, and there is no directivity in a discharge tube that one of the electrodes serves as a cathode and the other electrode serves as an anode.

A discharge tube 29 shown in Fig. 4 includes a casing 30 formed from a ceramics material and having a metallization at each of a pair of open end faces 31 thereof. Similarly as in the embodiments described hereinabove, airtight joining by brazing or by an oxide solder 33 is performed in a condition wherein a flange portion 32a of an electrode base 32 on which an electrode 6 is mounted by force fitting of a metal ring 5 is held in a closely contacting relationship with the corre-

sponding open end face 31. Further, while an enclosing pipe 34 for enclosing inert gas such as nitrogen gas into the tube is mounted on one of the electrode bases 32, brazing 35 is also applied between the enclosing pipe 34 and the electrode base 32, and the enclosing pipe 34 is sealed with a predetermined sealing material after enclosure of gas into the tube.

Here, the individual joining portions 33 and 35 by the brazing or the oxide solder described above can preferably stand at least against 300°C from various conditions of use of the discharge tube. Further, since there is the possibility that a high temperature atmosphere may be formed by the joining operation described above and the electrode 6 mounted on the electrode base 32 may be oxidized, there is the necessity of performing the joining operation in an oxygen-free condition such as in forming gas wherein H_2 and N_2 are mixed, in vacuum or in inert gas.

Meanwhile, in the case of the present embodiment, particularly there is the necessity of making the coefficients of thermal expansion of the electrode base 32 and the casing 30 substantially equal to each other to prevent occurrence of a crack or the like at the joining portion 33 by a heat cycle.

A discharge tube 36 shown in Fig. 5 is formed such that the area of an electrode base 38 for enclosing an open end portion of a casing 37 is reduced. The casing 37 is constituted from a body portion 37a having an end portion thereof drawn inwardly and opened at the other end thereof, and a lid portion 37b for fitting with the open end portion of the body portion 37a, and the body portion 37a and the lid portion 37b are butt joined in an airtight relationship by an oxide solder 39 or the like.

Meanwhile, an electrode 41 of the Rogowsky type adapted to be fitted into each of openings 40 of the body portion 37a and the lid portion 37b and having a smaller diameter than that in each of the embodiments described above is constituted such that a flange portion 41a formed at a base end thereof is engaged with a circumferential edge portion of the opening 40. And, the circumferential edge portion of the opening 40 is processed by metallization, and brazing 42 is performed while the flange portion 41a engaged with the circumferential edge portion is held by the electrode base 38 formed substantially into a lid configuration. Consequently, the open end portion of the casing 36 is sealed while maintaining communication between the electrode base 38 and the electrode 41.

It is to be noted that the conditions that the coefficient of thermal expansion of the electrode bases 38 is made substantially same as that of the casing 37, that the joining operation is performed in an oxygen-free condition, of heat resisting temperatures at the individual joining portions and so forth are similar to those of the embodiments described above.

Also a discharge tube 43 shown in Fig. 6 is constituted such that the area of an electrode base 45 for enclosing each open end portion of a casing 44 is reduced similarly as in the embodiments described above. An electrode plate 46 of the Rogowsky type is mounted on each of the electrode bases 45 by brazing in a condition wherein the electrode 46 is fitted in a hub portion 45a of the electrode base 45, and sealing of the casing 44 is attained by the electrode base 45 butt joined in an airtight relationship to the open end portion of the casing 44 by brazing or an oxide solder 47.

It is to be noted that the conditions that the casing 44 is constituted from a body portion 44a and a lid portion 44b, that the coefficient of thermal expansion of the electrode bases 45 is made substantially same as that of the casing 44, that the joining operation is performed in an oxygen-free condition and so forth are similar as in the embodiments described hereinabove.

By the way, while in the individual embodiments described so far the various discharge tubes are shown wherein at least a cathode side electrode is of the Rogowsky type having holes perforated therein as an electrode which is formed in a non-acute contour at an end portion thereof and a large number of irregularities such as concave or convex portions are formed at least on the anode side, the configuration of an electrode which has characteristics of a uniform electric field and a non-uniform electric field is not specifically limited to that of the Rogowsky type having holes formed therein. In the following, a configuration of an electrode of a type other than the Rogowsky type having holes formed therein which has both characteristics of a uniform electric field and a non-uniform electric field will be described. It is to be noted that a discharge tube in each of the following embodiments is constituted such that a pair of electrodes have a same configuration and the discharge tube itself does not have a directivity.

A discharge tube 48 shown in Fig. 7 is constituted such that a needle set electrode 52 formed by bundling a plurality of needle-formed electrodes 51 so as to form a non-uniform electric field is fitted in a hub portion 50a of each of a pair of electrode bases 50 for sealing open end portions of a casing 49, and ends 51a of the individual needle-shaped electrodes 51 are located on imaginary planes 53 so as to form a uniform electric field.

With the construction, the characteristic of a non-uniform electric field can be further intensified comparing with such an electrode of the Rogowsky type having holes perforated therein as described above, and the discharge voltage V_1 can be stabilized further. Further, if each of the imaginary planes 53 is modified into a Rogowsky configuration and the individual needle-shaped electrodes 51 are disposed such that the ends 51a thereof may be located on the Rogowsky type imaginary planes, then a further preferable electrode can be obtained.

To the contrary, a discharge tube 54 shown in Fig. 8 is constituted such that a substantially pipe-shaped electrode 57 having a plurality of recessed portions 58 formed at an end face 57a thereof so as to form a non-uniform electric field is securely mounted on an inner

face 56a of each of a pair of electrode bases 56 for sealing open end portions of a casing 55 and each of the end faces 57a is located in an imaginary plane 59 so as to form a uniform electric field.

With such construction as described above, the characteristic of a non-uniform electric field can be intensified further, and the discharge voltage V_1 can be stabilized. Further, if the electrodes 57 are disposed such that the end faces 57a thereof are located in the imaginary planes 59 formed as of the Rogowsky type, then a further preferable electrode can be obtained.

It is to be noted that while in each of the embodiments described so far nitrogen gas is illustrated as inert gas to be enclosed in the discharge tube, such nitrogen gas is optimum particularly for an ignition device with a series gap of an automobile engine or the like, and if inert gas to be enclosed is changed variously to air, argon, helium or the like, then the discharge voltage of the discharge tube can be changed from several tens kilovolts to several tens volts depending upon gas enclosed. Accordingly, the electrode structure of the present invention can be applied not only to a discharge tube of an ignition device with a series gap but to discharge tubes of various types such as a discharge tube for a flash device, a discharge tube used for a lightning arrester of a telephone switchboard or the like.

Further, the electrode of the Rogowsky type shown in the embodiments described hereinabove is an example of a configuration of a substantially flat plate-formed electrode wherein an end portion is formed into a non-acute configuration, and the discharge tube is not limited to that of the specific configuration. For example, similar effects can be obtained even where an end portion of an electrode is formed into a substantially semi-spherical configuration having a large radius.

As apparent from the foregoing description, according to the present invention, since substantially opposing end portions of a pair of electrodes are each formed into a non-acute contour and a large number of irregularities such as concave or convex portions are formed on a surface at least of the cathode side electrode, a stabilized high discharge voltage can be obtained from an initial stage of discharging with a comparatively small distance between the electrodes. Further, since the surface area of the electrodes is great, exhaustion of the electrodes are dispersed, and the electrodes are superior in durability. Further, since the distance between the electrodes is small, the discharge maintaining voltage is low and the energy loss is decreased.

Claims

1. A discharge tube comprising:

a casing (2); and

a pair of electrode means (6) including anode side electrode means and cathode side electrode means provided opposite each other within said casing (2) to cause a discharge therebetween, said anode side electrode means and said cathode side electrode means having opposing end portions (6a,6b) formed in a generally non-acute contour, the opposing end of said cathode side electrode means being formed with a multiplicity of irregularities (7) therein

characterized in that
the opposing end of the anode side electrode means is totally planar.

2. A discharge tube according to claim 1,
characterized in that
the anode side electrode means (11) being formed with a multiplicity of irregularities (13) therein while the opposing end of the cathode side electrode means (6) includes a planar face (6a) substantially opposing said planar anode side electrode means and a curved peripheral portion (6b) around said planar face to recede away from said anode side electrode means.

3. A discharge tubed comprising:

a casing (2); and

a pair of electrode means (6) including anode side electrode means and cathode side electrode means provided opposite each other within said casing to cause a discharge therebetween, said anode side electrode means and said cathode side electrode means having opposing end portions formed in a generally non-acute contour

characterized in that
said anode side electrode means and said cathode side electrode means include pipe-shaped electrodes (57) each having a rim formed with a plurality of recessed portions (58).

4. A discharge tube, according to one of claims 1 to 3
characterized in that
said casing (2) has opposite open ends, said cathode electrode means includes an electrode base (4) adapted to block one of said opposite open ends and having a substantially equal coefficient of thermal expansion to said casing and an electrode mounted on said electrode base (4) while said anode side electrode means includes an electrode plate (26) adapted to block one of said opposing open ends and having a substantially equal coefficient of thermal expansion to said casing.

5. A discharge tube according to claim 4, wherein said electrode base (4) is screwed into casing (2).

6. A discharge tube according to claim 4, wherein the electrode base (4) of the cathode side electrode means (6) is screwed into said casing (22) while the electrode base of the anode side electode means (26) is screwed over said casing (22).

7. A discharge tube according to claim 4, wherein said electrode base is force fit into said casing.

8. A discharge tube according to claim 4, wherein said electrode base is butt joined to said open end of said casing.

Patentansprüche

1. Entladungsröhre, die umfaßt:

ein Gehäuse (2); und

ein Paar Elektrodeneinrichtungen (6), das eine Anodenseiten-Elektrodeneinrichtung und eine Kathodenseiten-Elektrodeneinrichtung enthält, die einander gegenüberliegend in dem Gehäuse (2) angeordnet sind, um eine Entladung zwischen ihnen zu bewirken, wobei die Anodenseiten-Elektrodeneinrichtung und die Kathodenseiten-Elektrodeneinrichtung einander gegenüberliegende Endabschnitte (6a,6b) haben, die einen im allgemeinen nicht bogenförmigen Umriß aufweisen, wobei das gegenüberliegende Ende der Kathodenseiten-Elektrodeneinrichtung mit einer Vielzahl von Unregelmäßigkeiten (7) darin versehen ist,

dadurch gekennzeichnet, daß
das gegenüberliegende Ende der Anodenseiten-Elektrodeneinrichtung vollständig plan ist.

2. Entladungsröhre nach Anspruch 1, **dadurch gekennzeichnet,** daß,
die Anodenseiten-Elektrodeneinrichtung (11) mit einer Vielzahl von Unregelmäßigkeiten (13) darin versehen ist, während das gegenüberliegende Ende der Kathodenseiten-Elektrodeneinrichtung (6) eine plane Fläche (6a) enthält, die der planen Anodenseiten-Elektrodeneinrichtung im wesentlichen gegenüberliegt, sowie einen gekrümmten Umfangsabschnitt (6b) um die plane Fläche herum, der von der Anodenseiten-Elektrodeneinrichtung zurückweicht.

3. Entladungsröhre, die umfaßt:

ein Gehäuse (2); und

ein Paar Elektrodeneinrichtungen (6), das eine Anodenseiten-Elektrodeneinrichtung und eine Kathodenseiten-Elektrodeneinrichtung enthält, die einander gegenüberliegend in dem Gehäuse angeordnet sind, um eine Entladung zwischen ihnen zu bewirken, wobei die Anodenseiten-Elektrodeneinrichtung und die Kathodenseiten-Elektrodeneinrichtung einander gegenüberliegende Endabschnitte haben, die einen im wesentlichen nicht bogenförmigen Umriß aufweisen,

dadurch gekennzeichnet, daß
die Anodenseiten-Elektrodeneinrichtung und die Kathodenseiten-Elektrodeneinrichtung rohrförmige Elektroden (57) enthalten, die jeweils einen Rand aufweisen, der mit einer Vielzahl vertiefter Abschnitte (58) versehen ist.

4. Entladungsröhre nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, daß**
das Gehäuse (2) einander gegenüberliegende offene Enden aufweist, wobei die Kathoden-Elektrodeneinrichtung einen Elektrodenhalter (4) enthält, der eines der einander gegenüberliegenden offenen Enden verschließt und einen Wärmeausdehnungskoeffizienten hat, der im wesentlichen dem des Gehäuses gleich ist, sowie eine an dem Elektrodenhalter (4) angebrachte Elektrode, während die Anodenseiten-Elektrodeneinrichtung eine Elektrodenplatte (26) enthält, die eines der einander gegenüberliegenden offenen Enden verschließt und einen Wärmeausdehnungskoeffizienten hat, der im wesentlichen dem des Gehäuses gleich ist.

5. Entladungsröhre nach Anspruch 4, wobei der Elektrodenhalter (4) in das Gehäuse (2) eingeschraubt ist.

6. Entladungsröhre nach Anspruch 4, wobei der Elektrodenhalter (4) der Kathodenseiten-Elektrodeneinrichtung (6) in das Gehäuse (22) eingeschraubt ist, während der Elektrodenhalter der Anodenseiten-Elektrodeneinrichtung (26) auf das Gehäuse (22) aufgeschraubt ist.

7. Entladungsröhre nach Anspruch 4, wobei der Elektrodenhalter in das Gehäuse eingepreßt ist.

8. Entladungsröhre nach Anspruch 4, wobei der Elektrodenhalter mit dem offenen Ende des Gehäuses stumpfverlötet ist.

Revendications

1. Tube à décharge, comprenant :

un boîtier (2) ; et
un couple de moyens formant électrodes (6) incluant un moyen formant électrode côté anode et un moyen formant électrode côté cathode disposés en face l'un de l'autre à l'intérieur dudit boîtier (2) pour provoquer une décharge entre eux, ledit moyen formant électrode côté anode et ledit moyen formant électrode côté cathode ayant des parties d'extrémité opposées (6a, 6b) formées en un profil globalement non aigu, l'extrémité opposée dudit moyen formant électrode côté cathode étant formée avec une multiplicité d'irrégularités (7) en son sein

caractérisé en ce que
l'extrémité opposée du moyen formant électrode côté anode est totalement plane.

2. Tube à décharge selon la revendication 1,
caractérisé en ce que
le moyen formant électrode côté anode (11) étant formé avec une multiplicité d'irrégularités (13) en son sein tandis que l'extrémité opposée du moyen formant électrode côté cathode (6) comprend une face plane (6a) sensiblement en face dudit moyen formant électrode côté anode plane et une partie périphérique incurvée (6b) autour de ladite face plane pour être en retrait par rapport audit moyen formant électrode côté anode.

3. Tube à décharge comprenant :

un boîtier (2) ; et
un couple de moyens formant électrodes (6) incluant un moyen formant électrode côté anode et un moyen formant électrode côté cathode disposés en face l'un de l'autre à l'intérieur dudit boîtier pour provoquer une décharge entre eux, ledit moyen formant électrode côté anode et ledit moyen formant électrode côté cathode ayant des parties d'extrémité opposées formées en un profil globalement non aigu

caractérisé en ce que
ledit moyen formant électrode côté anode et ledit moyen formant électrode côté cathode comprennent des électrodes en forme de tuyau (57), chacune ayant un rebord formé avec une pluralité de parties en retrait (58).

4. Tube à décharge, selon l'une des revendications 1 à 3,
caractérisé en ce que
ledit boîtier (2) possède des extrémités ouvertes opposées, ledit moyen formant électrode de cathode comprend une base d'électrode (4) conçue pour bloquer l'une desdites extrémités ouvertes opposées et ayant un coefficient de dilatation thermique sensiblement égal audit boîtier et une électrode montée sur ladite base d'électrode (4), tandis que ledit moyen formant électrode côté anode comprend une plaque d'électrode (26) conçue pour bloquer l'une desdites extrémités ouvertes opposées et ayant un coefficient de dilatation thermique sensiblement égal audit boîtier.

5. Tube à décharge selon la revendication 4, dans lequel ladite base d'électrode (4) est vissée dans le boîtier (2).

6. Tube à décharge selon la revendication 4, dans lequel la base d'électrode (4) du moyen formant électrode côté cathode (6) est vissée dans ledit boîtier (22) tandis que la base d'électrode du moyen formant électrode côté anode (26) est vissée au-dessus dudit boîtier (22).

7. Tube à décharge selon la revendication 4, dans lequel ladite base d'électrode est ajustée en force dans ledit boîtier.

8. Tube à décharge selon la revendication 4, dans lequel ladite base d'électrode est jointe par aboutement à ladite extrémité ouverte dudit boîtier.

FIG. 1

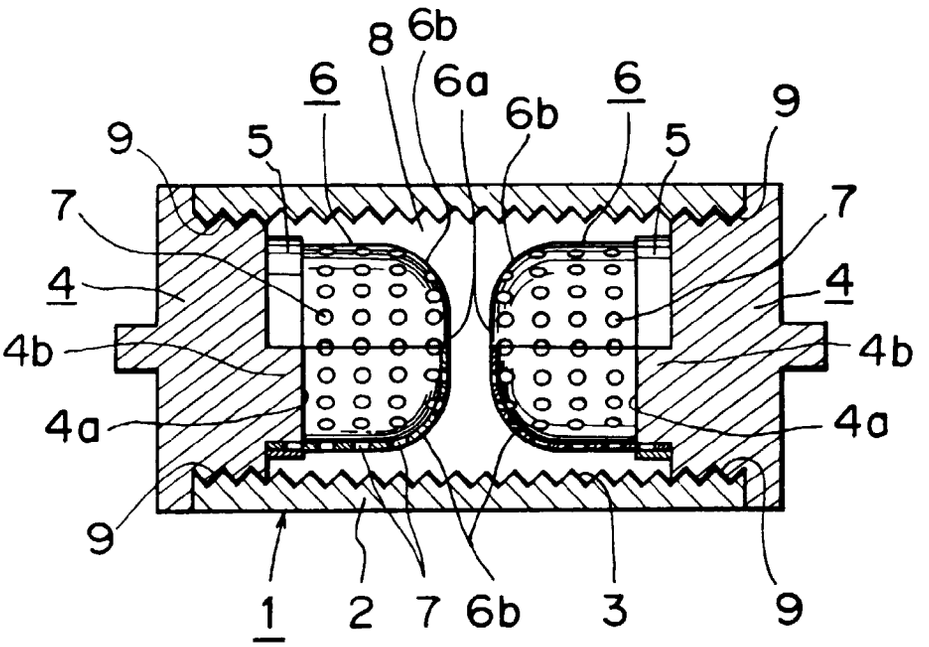

8
6b
6
6a
6b
6
9
9
5
5
7
7
4
4
4b
4b
4a
4a
9
9
1
2
7
6b
3

FIG. 2A

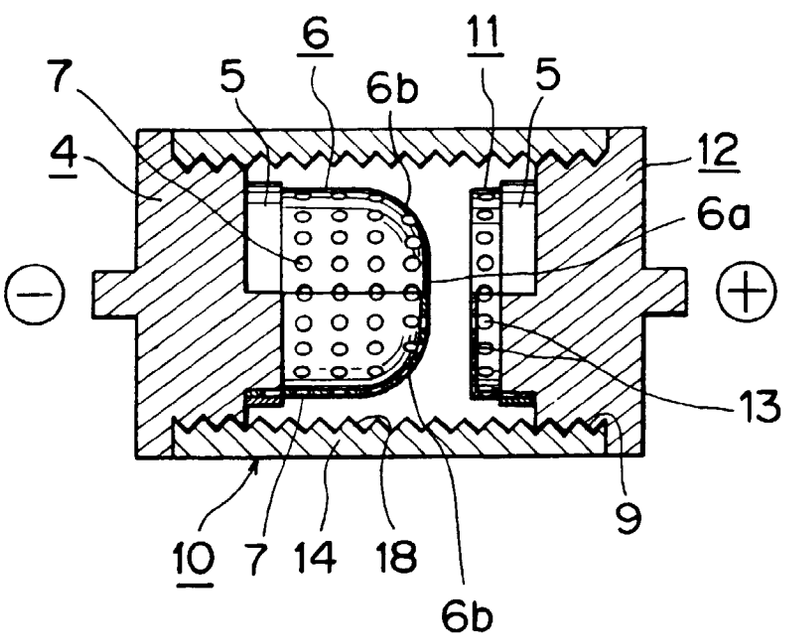

6
11
7
5
6b
5
4
12
6a
13
9
10
7
14
18
6b

FIG. 2B

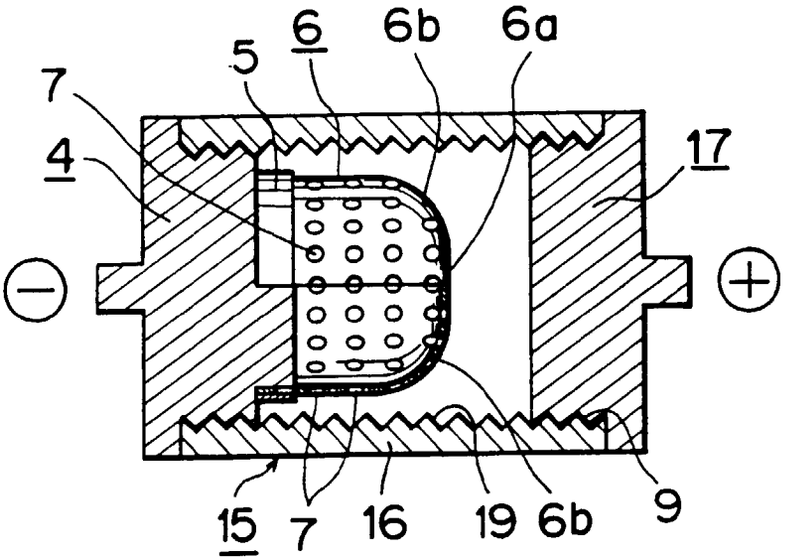


FIG. 3A

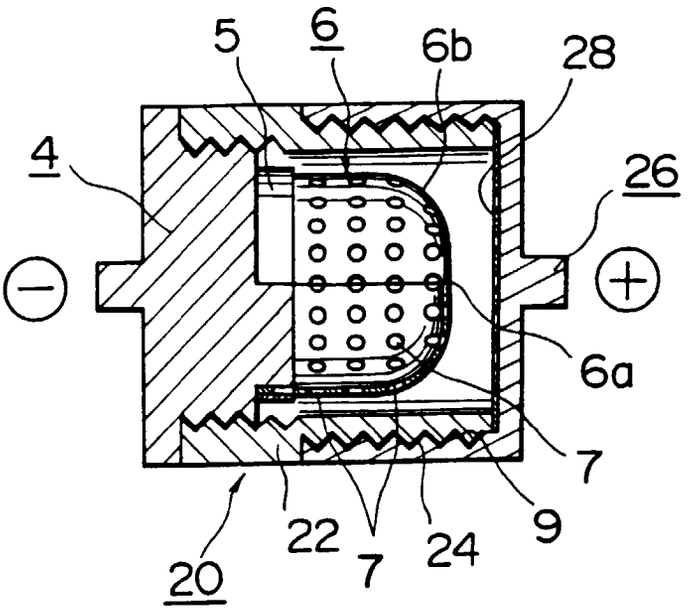


FIG. 3B

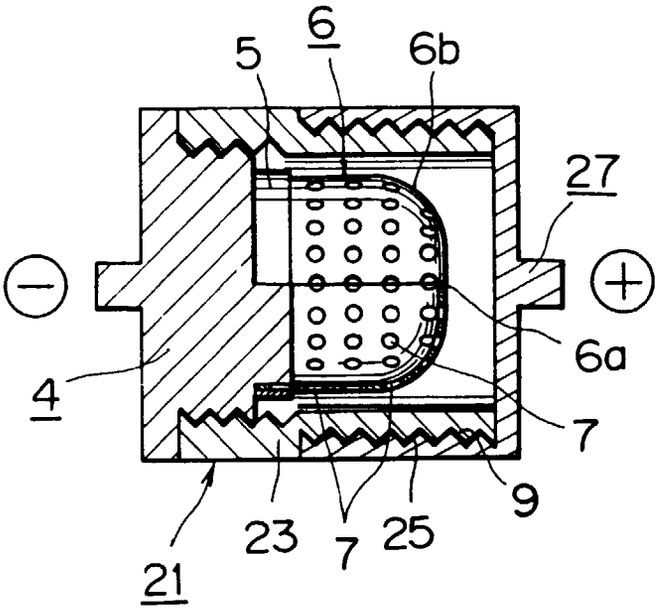


FIG. 4

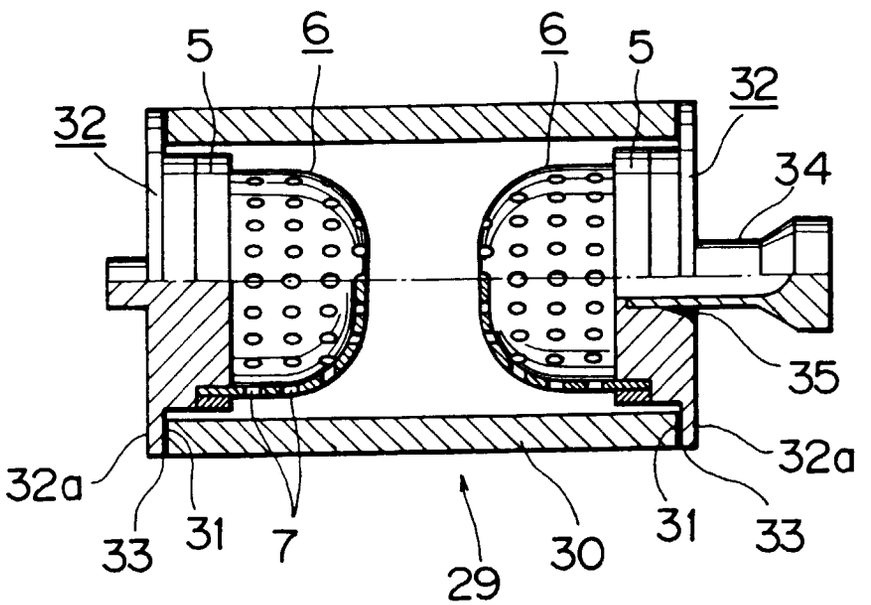


FIG. 5

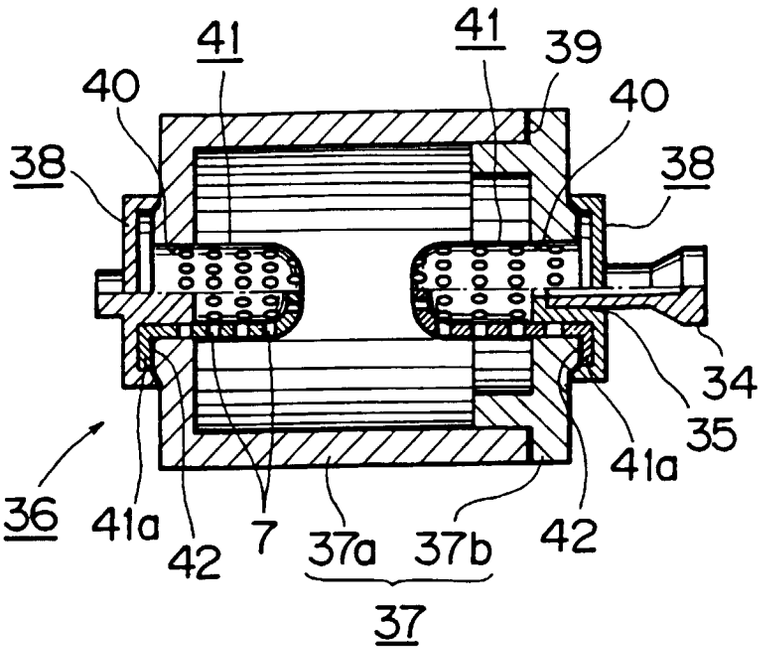

41
41
39
40
40
38
38
34
35
41a
36
41a
42
7
37a
37b
42
37

FIG. 6

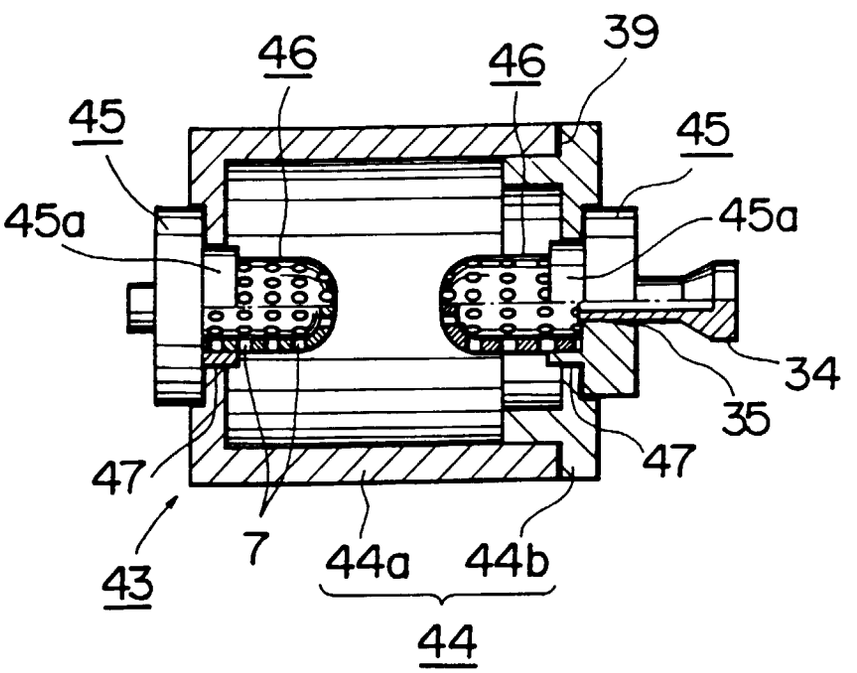

46
46
39
45
45
45a
45a
34
35
47
47
43
7
44a
44b
44

FIG. 7

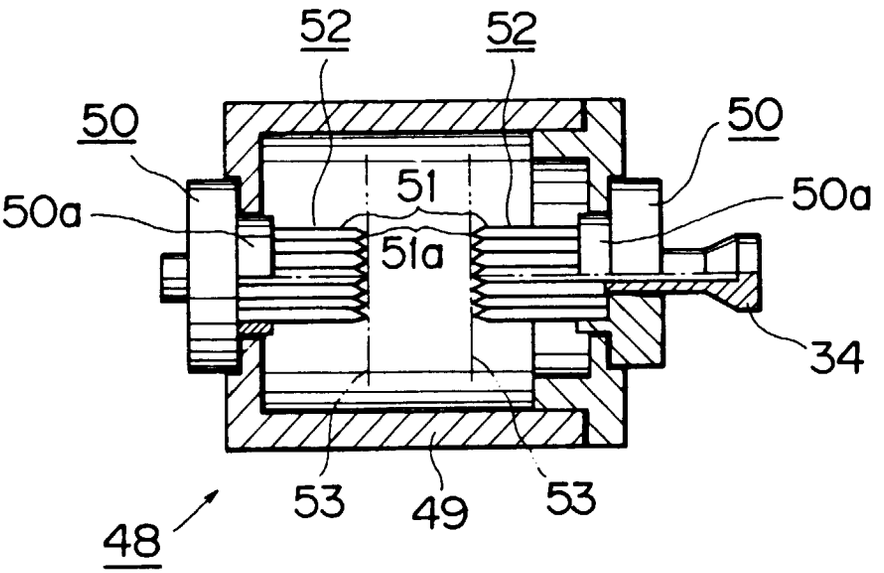

52
52
50
50
51
50a
50a
51a
34
53
49
53
48

FIG. 8

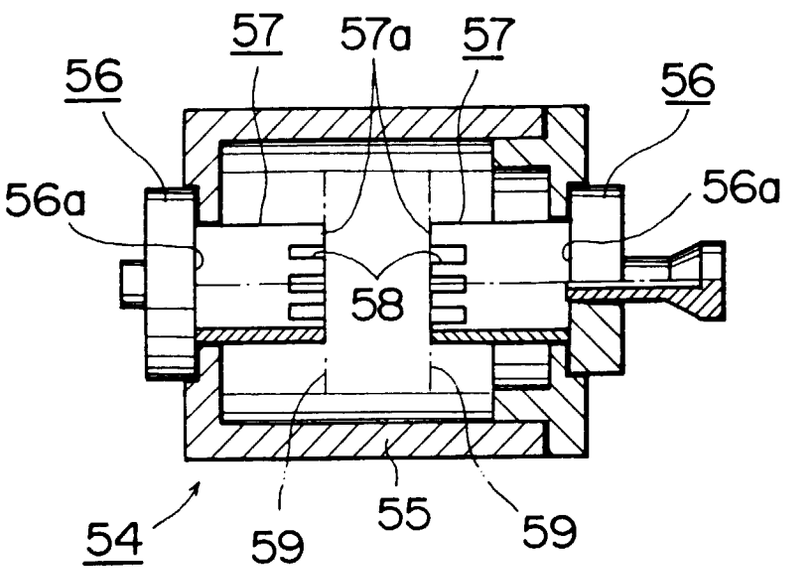

57
57a
57
56
56
56a
56a
58
54
59
55
59

FIG. 9
PRIOR ART

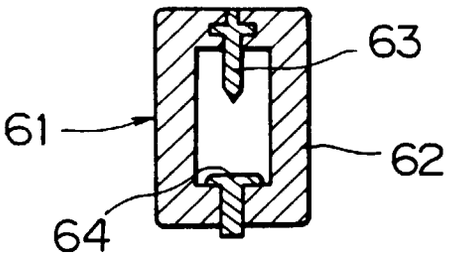


FIG. 10
PRIOR ART

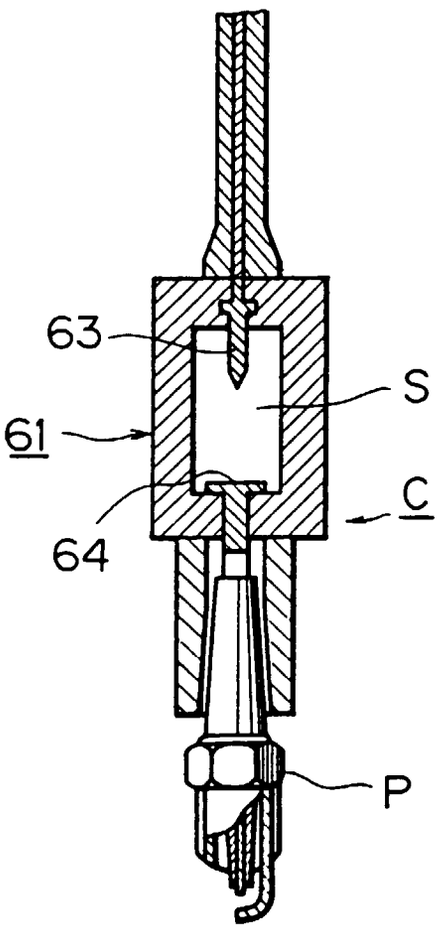


FIG. 11
PRIOR ART

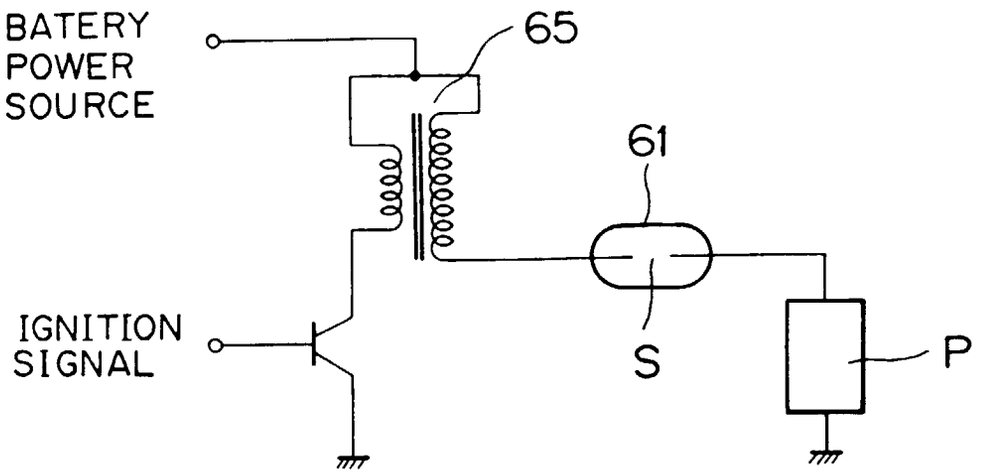


FIG. 12
PRIOR ART

