ANODE TUBE FOR HIGH VOLTAGE IONIC VALVES

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Fig.1

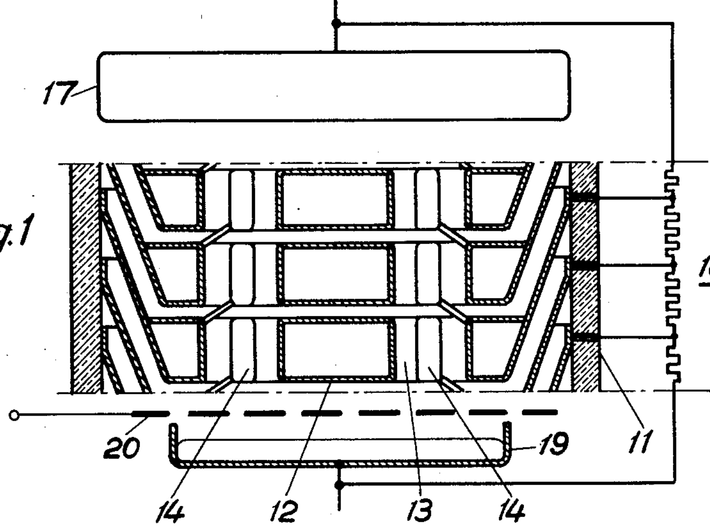


Fig.2

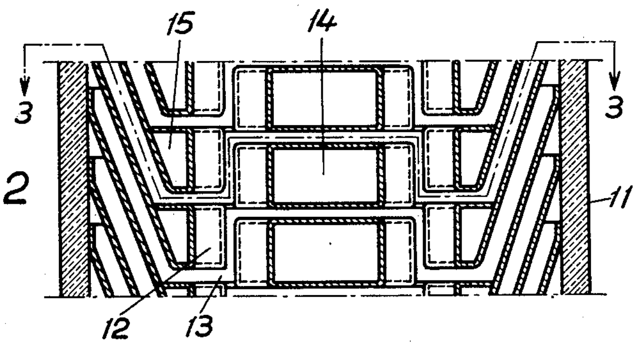
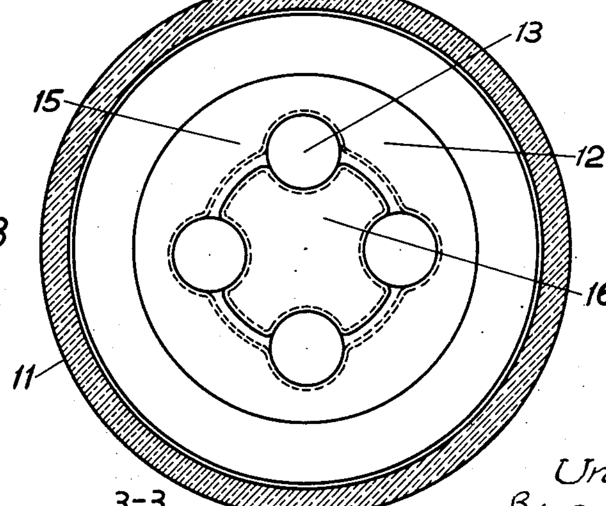


Fig.3



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ANODE TUBE FOR HIGH VOLTAGE IONIC VALVES

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7 Claims. (Cl. 313—313)

In anode tubes of the type disclosed in Patent No. 2,446,600 with insulating walls for high voltage ionic valves there are usually inserted between the anode and the cathode space several conducting bodies on which are impressed, during the inactive period of the valve, such potentials from a potentiometer resistor or the like as to make the voltage distribution along the current path as uniform as possible, for the purpose of preventing a back-arcing. A construction of the conducting bodies, in which each body has a number of channels of substantial length (of the same order of magnitude as the width) and in which these channels lie opposite each other in the different bodies so as to form substantially straight through channels for the passage of the current, has for several reasons proved to be preferable to a construction, in which the bodies are substantially in the form of grids the ports of which may be displaced relatively to each other.

Experiments have however shown, that in using bodies having tubular channels disturbances may arise in the form of a back current from the cathode to a body comparatively adjacent thereto. It is true that such a back current is limited by the potentiometer resistance, but it may still initiate a total back-arcing or another disturbance. In investigating the cause of this phenomenon the theory has been posed that it may depend on the so-called hollow cathode effect, which implies that it is easier to initiate a glow discharge from a tubular cathode than from a plane one, and which may be explained in such manner, that electrons movable in the cross direction will repeatedly rebound from the opposite walls of the tube and thereby obtain a total path of movement of such length, that the probability of provoking an ionisation by impact will be rather great also in a very thin atmosphere.

Starting from this theory, the object of the present invention is the elimination of the back current to conducting bodies having tubular channels by such an arrangement, that the limiting walls of the free cross-section of at least part of said channels contain at least two portions of different potential. Free electrons which are repelled by the body of the lower potential will then immediately be absorbed by the body of the higher potential, whence a repeated rebounding of the electrons is out of question. It has been found practically, that the above construction has led to the desired result.

In order to achieve the said result it is advisable, that the bodies kept at different potentials have substantially the same extent in the longitudinal direction of the tube, whereby all electrons repelled by one of the bodies have a chance to be absorbed by the other. It is also desirable that the bodies also in other respects form opposite sides of the tube wall, for instance either so that one semi-cylindrical part of the wall of each tube has one potential and the other semicylindrical part another, or so that the channel is made annular in section with one potential on its inner wall and another on its outer one.

As a rule, the main part of the body or disc containing the channels is made in one piece with a common potential, and a part separated from the main part and having another potential is arranged so as to form a wall partially limiting the channel. The potential of the last-mentioned part may for instance be equal to the potential of the main part of the adjacent disc, whereby the necessary number of leading-in conductors for impressing the different potentials need not be greater than for discs having uniform potentials. Of course also another potential distribution may be employed.

Two forms of the invention are illustrated in vertical sections in Figs. 1 and 2 of the accompanying drawing, while Fig. 3 shows a cross-section on the broken line 3—3 in Fig. 2.

Each of the Figs. 1 and 2 shows three discs for potential distribution mounted in an anode tube **11** of insulating material, for instance porcelain. The discs are shown as made from sheet metal, for instance sheet iron, and their inner parts are box-shaped, but they may as well, in a manner known per se, be of other material and substantially solid. Each box-shaped portion **12** has a circular row of channels **13** for the passage of the current. In Fig. 1, the whole outer wall of each such channel **13** forms part of the same disc in the usul manner, but in addition to this, there is a central cylinder **14** in each channel, making the free space in each channel of annular cross-section, and this central cylinder is conductively connected to the main portion of the adjacent disc which also preferably supports it mechanically. In this way, every portion of the free space in the channel will be limited sidewise by two parts of different potentials, namely the outer wall having one potential and the central cylinder having a different one, equal to that of the main part of the adjacent disc, whereby practically any electron repelled from the surface having the lower potential is immediately absorbed by the opposite surface having the higher potential and thus no rebounding under repeated acceleration can take place.

Fig. 1 also shows an anode **17** and a potential resistor **18** for suppressing different potentials on the conducting bodies, and a control grid **20** and a cathode **19**.

In Figs. 2 and 3, the dotted lines are intended to show the thickness of the material of the discs, and practically half of the outer wall of each channel **13** has one potential and the other half a different one. This is due to the fact that the central portion **16** of each disc has a position which in height nearly coincides with that of the external portion of the adjacent disc above. The boundary between the said central and external portions substantially follows a cylindrical surface through the center lines of the channels **13**. In this manner, substantially half of the outer wall of each channel **13** will have a potential different from that of the other half, whereby the result will be substantially the same as in the form according to Fig 1.

The lowermost disc—preferably that lying nearest to the cathode—may as a part of different potential have one with essentially the potential of the cathode or of a grid **20** for ignition control or similar purpose, which may form an independent constructional element, thus not connected to the main part of any disc.

If experience should prove that the perturbations intended to be eliminated by the present invention have not the same tendency to appear at all the voltage-distributing discs belonging to a series, but for instance to appear only in the disc or discs next to one or both ends of the series, it may of course be sufficient to divide the discs into portions of different potentials only at the places where the perturbations show the greatest tendency to occur.

I claim as my invention:

1. Conducting bodies for insertion between the anode and the cathode space in high-voltage ionic valves, comprising a tube of insulating material, a number of said conducting bodies supported by said tube, means for impressing different potentials on adjacent conducting bodies, each of said conducting bodies being provided with a plurality of channels constituting discharge paths, said channels consisting of wall portions from two adjacent conducting bodies forming opposite limiting walls in relation to the discharge path of at least some of the channels.

2. Conducting bodies according to claim 1, in which the channel wall portions from the two adjacent conducting bodies have substantially equal extent in the direction of the discharge path through a channel.

3. Conducting bodies according to claim 1, in which the parts are so connected that a main channel wall portion has one potential and a minor wall portion has the same potential as the main wall portion of an adjacent conducting body.

4. Conducting bodies according to claim 1, in which the parts are so connected that a main channel wall portion has one potential and another wall portion, forming substantially the half of the circumference of the channel wall, which portion has the same potential as the main wall portion of an adjacent conducting body.

5. Conducting bodies according to claim 1, in which

the parts are so connected that each of the conducting bodies consists of a main channel wall portion of one potential, said portion forming the outer, circumferential wall of a discharge path, and another inner wall portion inside and co-axial with said last-mentioned wall portion, said inner portion being mechanically connected with the adjacent conducting body forming the main wall portions of the channels through the said adjacent conducting body, the inner wall portions thus having the same potential as that adjacent conducting body.

6. Conducting bodies according to claim 1, in which the parts are so connected that a wall portion having a potential near that of the cathode forms one part of the conducting body lying nearest to the cathode.

7. Conducting bodies according to claim 1, in which the parts are so connected that a wall portion having a potential near that of the cathode forms one part of the conducting body lying nearest to the cathode and a portion having the potential of a control grid forms another part of said conducting body.

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