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GETTER ASSEMBLY

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Fig_1

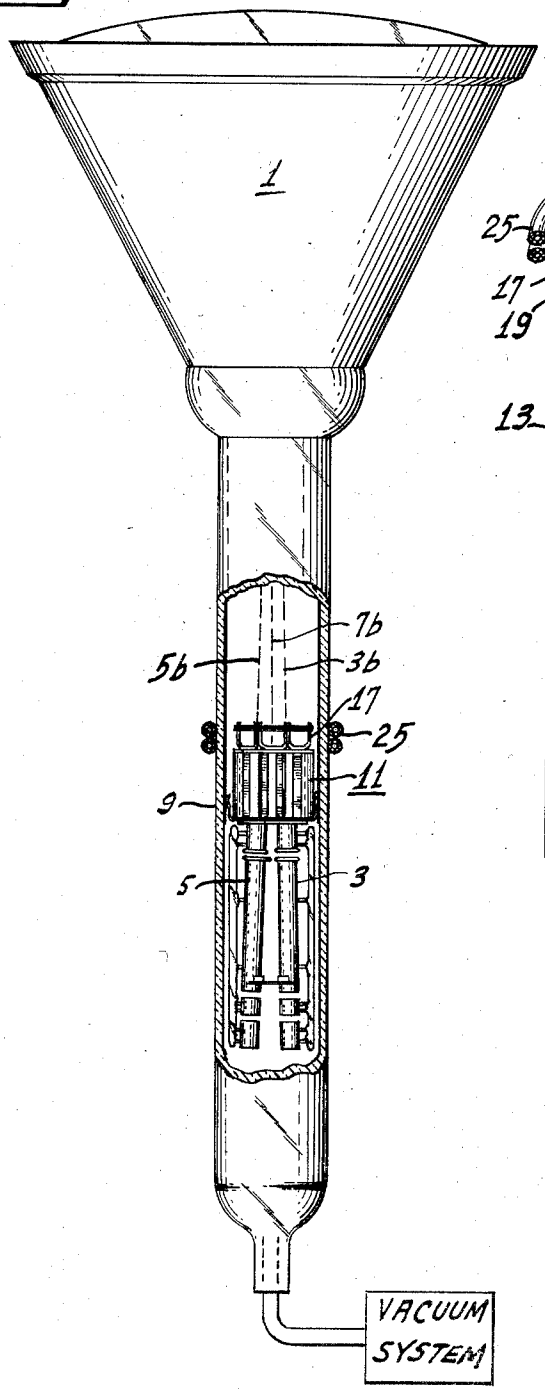
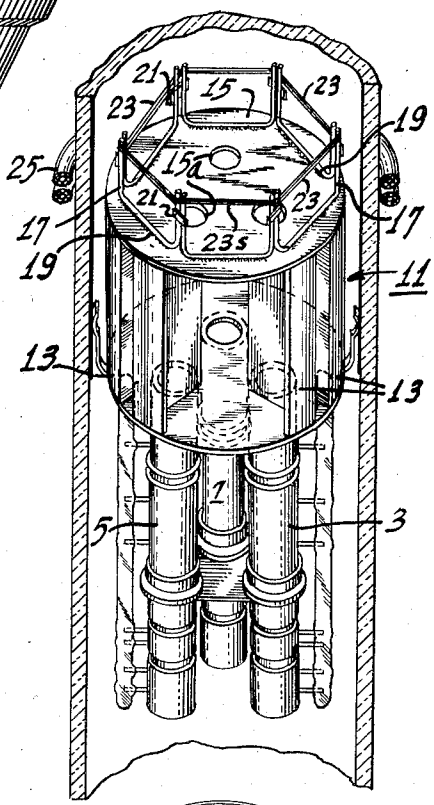


Fig_2



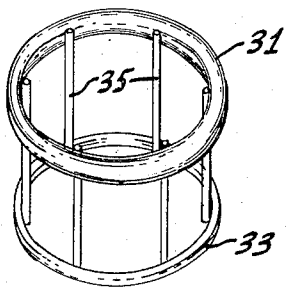


Fig_3

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GETTER ASSEMBLY

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9 Claims. (Cl. 313—176)

This invention relates to a getter assembly which is particularly useful in degassing large electron tubes such as cathode ray tubes.

In the manufacture of electron tubes, one of the steps normally required to properly degas a tube consists in flashing a getter. A getter is primarily a chemically active material, and usually includes one of the alkaline earth metals, which can be heated and volatilized, after the tube has been evacuated to a desired degree, to absorb the remaining traces of gas. The getter material, or gas clean-up agent, as it is frequently called, may be carried by a metal trough having a higher melting point than the getter material. One or more getter troughs may be connected across the legs of a U-shaped wire support to form a closed electrical loop. The getter loop so formed and supported within the tube envelope is heated by a high frequency induction coil to volatilize or flash the getter material. On flashing, the getter material combines with any residual gas, such as oxygen, which is not removed by the mechanical pumps, and forms a deposit of the alkaline earth metal on the inner wall of the glass envelope.

Large electron tubes, such as cathode ray tubes require a considerable amount of getter material to properly degas the tube. This is especially true of tri-color kinescopes of the kind containing three guns. In such relatively complicated tubes, the use of a single getter loop, with one or more getter troughs, is usually unsatisfactory. In the first place, such a getter assembly is necessarily large and requires a great amount of power to flash the getter. Secondly, it is difficult to control the flash to prevent the getter material from being deposited on the various electrode elements. Thirdly, the getter deposit is ordinarily concentrated within a relatively small area of the glass envelope, whereas it is desirable to distribute the flash, and hence the deposit, over as large an area as possible to provide better gas clean-up. Another reason why a single getter loop of the type discussed is not satisfactory is that if the getter loop is initially open, or is opened up during flashing because of mechanical failure or overheating, the getter will not flash, or cannot be re-flashed.

It has therefore been customary to use a plurality of loop getters in large size cathode ray tubes. A common arrangement comprises two or more getters mounted at the open end of the gun, i. e. remote from its cathode. The getters are arranged axially and transversely symmetrical within the tube neck wth the plane of each getter loop parallel to the neck axis. They must be flashed individually by a battery of induction coils, one for each getter, with the coil axis normal to the axis of the neck and hence normal to the plane of the getter loop.

Such plural-getter arrangements also have certain disadvantages. In the first place, the getters must be separately flashed and, a given getter loop when in the flashing position is physically outside of the induction coil, where the magnetic field is relatively weak, rather than

within it where the field is strongest. As a consequence, considerable power is required to flash the getters. The spacing between the separate coils and separate getters is quite critical. Further, it is impractical to use more than three loop getters in such an arrangement because of the wide coil-to-getter spacing required to group more than three coils about a relatively narrow tube neck.

It is therefore an object of this invention to provide an improved getter assembly.

Another object is to provide a getter assembly which overcomes the problems of critical getter-to-induction coil spacing.

It is a further object to provide a compact getter assembly which allows uniform flashing of a relatively large amount of getter material with a reduced amount of power.

It is a further object to provide a getter assembly adapted to be flashed in alternate ways.

The foregoing and related objects are achieved in accordance with the invention by the provision of a getter assembly having a closed main conductive loop, which carries getter material along all or most of its length, and a plurality of auxiliary induction loops supported in planes transverse to the main loop by suitably shaped conductors which are connected to the main loop at spaced intervals such that each auxiliary loop has a portion common to the main or getter loop. This structure is mounted in the neck of a cathode ray tube, with the main getter loop coaxial with the tube axis. When thus mounted, the main getter induction loop may be flashed by a single induction coil coaxial with the tube. Alternatively, or additionally, the auxiliary induction loops may be flashed individually by induction coils oriented transverse to the tube axis.

The invention is described in greater detail in connection with the accompanying single sheet of drawings wherein:

Fig. 1 is a sectional view of a 3-gun color kinescope incorporating an improved getter assembly within the invention, the tube being shown "on the pump";

Fig. 2 is an enlarged perspective view of the getter assembly of Fig. 1; and

Fig. 3 is a perspective view of another form of getter assembly according to the invention.

The three-gun kinescope shown "on the pump" in Fig. 1 comprises a main chamber 1, which will be understood to contain a suitable screen-unit or target assembly, not shown, for a battery of three guns 3, 5 and 7 in the dependent glass neck portion 9 of the tube envelope. The guns are here shown arranged delta (Δ) fashion as in Schroeder 2,595,548. The particular gun assembly here shown is similar to the one claimed by Albert M. Morrell in copending application Serial No. 364,041, now U. S. Patent 2,752,520, wherein the guns terminate in a cylindrical structure 11 containing a number of upstanding pole pieces 13 which operate to maintain the three electron beams 3*b*, 5*b*, 7*b* converged throughout their scanning movement. The structure 11 terminates in a disc 15 containing apertures 15*a* for the separate beams, and which provides a support for the getter assembly of the present invention.

As shown more clearly in Fig. 2 the getter supports comprise a number, in this case six, of U-shape conductors 17 disposed in hexagonal array on the outer surface of the disc 15 and secured thereto in an upright position as by clamps or welds 19. The upright arms of each U are electrically and mechanically coupled to the next adjacent U by metal straps 21. A getter "trough" 23 is secured at its opposite ends, as by welding to the upstanding arms of each U-shape support 17. The "troughs" 23 here shown are of a conventional construction and comprise a cylindrical sleeve formed of thin

metal, such as nickel, having a higher melting point than the getter material which is contained therein. The getter material, not shown, may comprise a conventional mixture of barium, magnesium and aluminum, for example. The wall of each "trough" or sleeve 23 may be thinned down along its length or it may be provided with a longitudinal slit 23*s* so that it will burst upon heating to expel the getter material. The direction of the getter "flash" of course depends upon the orientation of the thinned portion or slit in the sleeve or trough. In the instant case the slits 23*s* face outwardly so that the flash is toward the wall of the neck 9 of the envelope.

As previously pointed out, the metal straps 21 about the upstanding arms of each of the U-shaped getter-supports 17 provide a series connection between all of the getter troughs 23. This electrical path or main getter induction loop is concentric with the axis of the tube, and it is possible therefore to induce a current in it with a conventional radio-frequency induction coil 25 disposed concentrically about the outer surface of the neck 9 in line with the getter array. It is also possible to couple into anyone of the individual or "closed-U induction loops" with a radio frequency coil, not shown, whose axis is at right angles to the tube neck.

Figure 3 shows an alternative form of getter structure which is especially suitable for use in a tube having no apertured disk 15 of Figure 1 as a means of support. The assembly comprises a main getter trough in the form of a loop 31 and a supporter ring 33 spaced from each other by lateral support rods 35 connected to the loop 31 and ring 33 at spaced intervals. The "main" getter-loop 31 here shown is a continuous trough of ring form containing a getter material, not shown. The "auxiliary induction" loops are formed by adjacent support rods 35 and the portions of the getter loop 31 and support ring 33 therebetween.

Other modifications may be made in structural details which will adapt the getter assembly to the particular tube and method of processing. For example, the auxiliary loops themselves may carry additional getter material other than that carried by the main getter loop, thus providing a copious supply of getter and permiting flashing from many directions.

Relatively little power is needed to flash the "main" or "series loop" in either embodiment of the invention since current is inducted only in said loop and not in the auxiliary or "closed-U loops." Furthermore, the main loop is located concentrically with the coil where the magnetic flux is most concentrated. Uniform flashing is achieved because the whole getter is flashed at one time.

In the event that the main loop opens-up, for example by reason of overheating, the "closed-U" or auxiliary loops may be availed of to provide further flashing. This may be done by presenting an induction coil to each auxiliary loop. Moreover, should an open circuit occur along the getter trough itself, the heating circuit through the main loop can nevertheless be completed through the getter support shunting the particular open portion of the getter trough.

The advantages and novel features of the getter-assemblies of the present invention are as follows:

A. Since the main getter loop, the tube neck and the radio frequency coil are concentric with each other, there are no critical spacing problems involved in obtaining the optimum amount of coupling to properly degas and flash the getter.

B. Should the main getter loop open, due to excessive radio frequency power or mechanical failure, or should it be necessary to reflash, it is still possible to individually flash the getters by coupling into each small getter loop with a radio frequency coil positioned at right angles to the tube neck.

C. A relatively large number of getters and, therefore, a large amount of gettering material may be placed in the tube in a compact assembly and with minimum amount of radio frequency power required to degas and flash the getters, since only the getter strip itself and not the associated wire loop is heated.

D. The time required to flash the getters is reduced since all getters will flash at one time.

What is claimed is:

1. A getter assembly comprising a main vaporizable getter loop, a plurality of conductive portions secured to and forming with said main getter loop closed auxiliary induction loops, each of said auxiliary induction loops including a different portion of said getter loop, said auxiliary induction loops extending angularly from said getter loop.

2. A getter assembly comprising conductive material arranged to form a main closed induction loop, a plurality of auxiliary closed induction loops, separate portions of said main loop each forming a part of different ones of said auxiliary loops, each of said auxiliary loops including conductive portions secured to and extending angularly from said main loop, and a quantity of getter material forming part of said main loop.

3. The invention according to claim 2 wherein said quantity of getter material also forms a part of said auxiliary loops.

4. A getter assembly comprising conductive material arranged in a plane to form a main closed induction loop, a plurality of auxiliary closed induction loops, each of said auxiliary loops including elongated conductive portions secured to and disposed in a plane perpendicular to said main loop, and separate portions of said main loop each forming a part of different ones of said auxiliary loops, and a quantity of getter material forming a part of said main loop.

5. The invention of claim 2 wherein said auxiliary loops include additional getter material.

6. A getter assembly comprising a closed main loop of conductive material adapted to have heating currents induced therein by a magnetic field directed normal to the plane of the loop, and a plurality of auxiliary closed loops of conductive material spaced about said main loop, each of said auxiliary loops including a separate portion common to said main loop and including a U-shaped member defining a plane transverse to the plane of said main loop, said U-shaped member forming a closed loop with said separate portion whereby heating currents may be induced in each of said auxiliary loops by a magnetic field directed normal to said auxiliary loop, and a quantity of getter material forming a part of each one of said portions common to said main and auxiliary loops.

7. A getter assembly comprising a closed main loop of conducting material adapted to have heating currents induced therein by a magnetic field directed normal to the plane of the loop, a conducting support member in a plane substantially parallel to said main loop, and a plurality of spaced support rods interconnecting said main loop and said support member and forming a plurality of auxiliary closed electrical loops transverse to said main loop, and a quantity of getter material forming a part of said main loop.

8. A getter assembly comprising a flat support member, a plurality of U-shaped conducting members extending away from said support member and with their bases on said support member, said U-shaped members being interconnected electrically and in substantially circular array, a getter trough connecting the legs of each of said U-shaped members, and a quantity of vaporizable getter material within said getter trough.

9. In an evacuable envelope having a central axis, a getter-assembly comprising a plurality of U-shaped conductive elements symmetrically disposed in spaced relationship about said central axis, separate getter-

containers constituted of conductive material supported between the arms of each of said U-shaped elements, and conductive means connecting said U-shaped elements in series to permit simultaneous flashing of the getter-material in said containers by currents induced in said assembly by a magnetic field.

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