

May 22, 1951

J. E. CLARK ET AL
SEALING FIXTURE FOR THE MANUFACTURE OF
ELECTRON DISCHARGE DEVICES

2,553,749

Filed May 5, 1948

2 Sheets-Sheet 1

FIG. 1

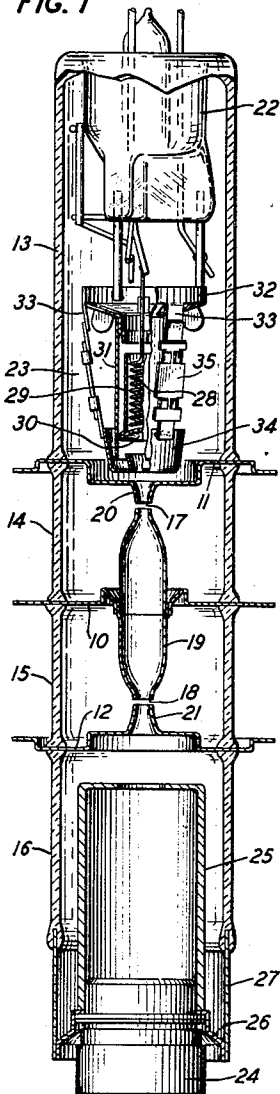
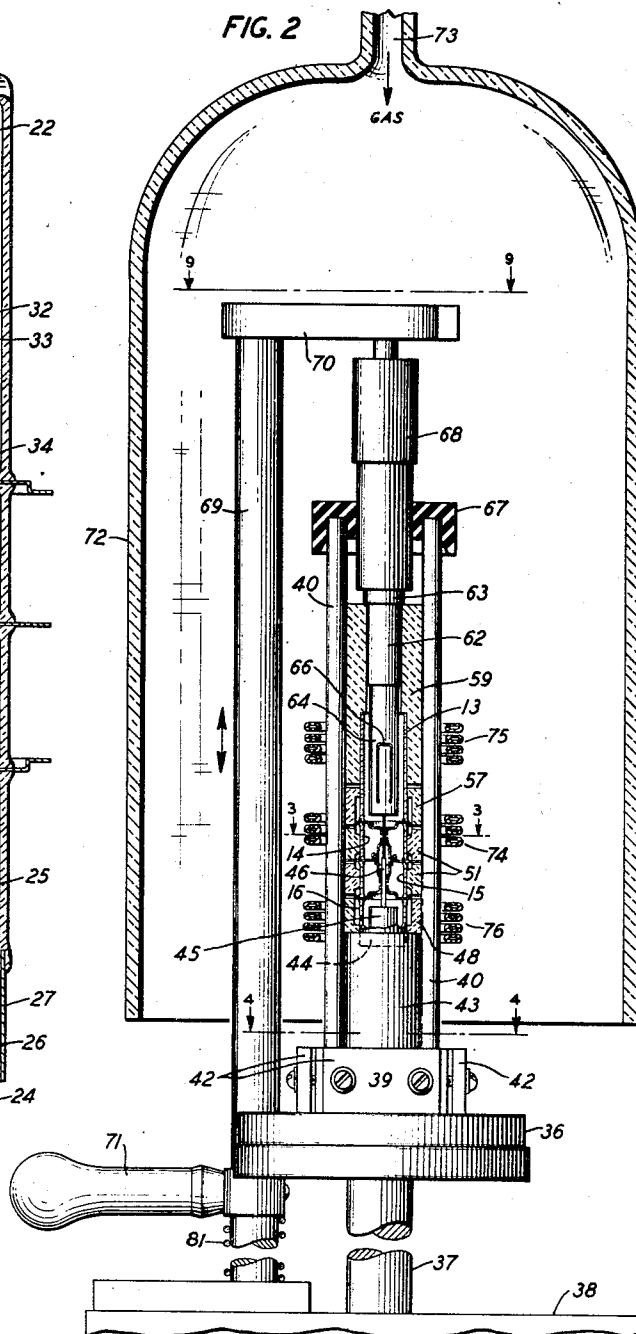


FIG. 2



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FIG. 3

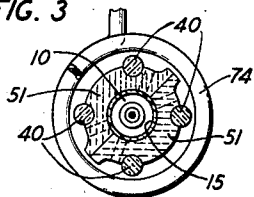


FIG. 4

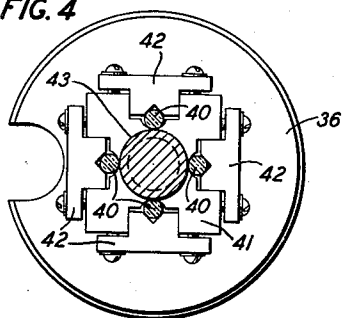


FIG. 5

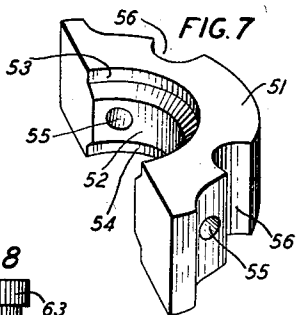
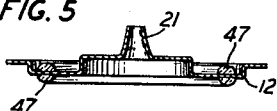


FIG. 8

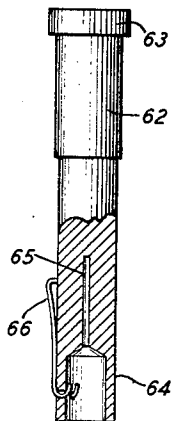


FIG. 9

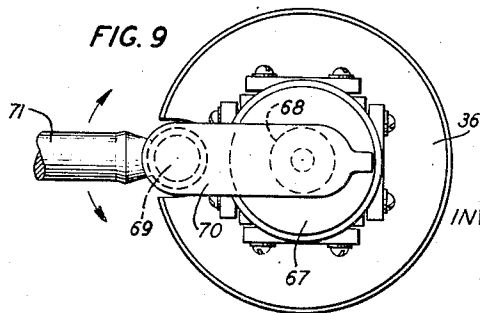
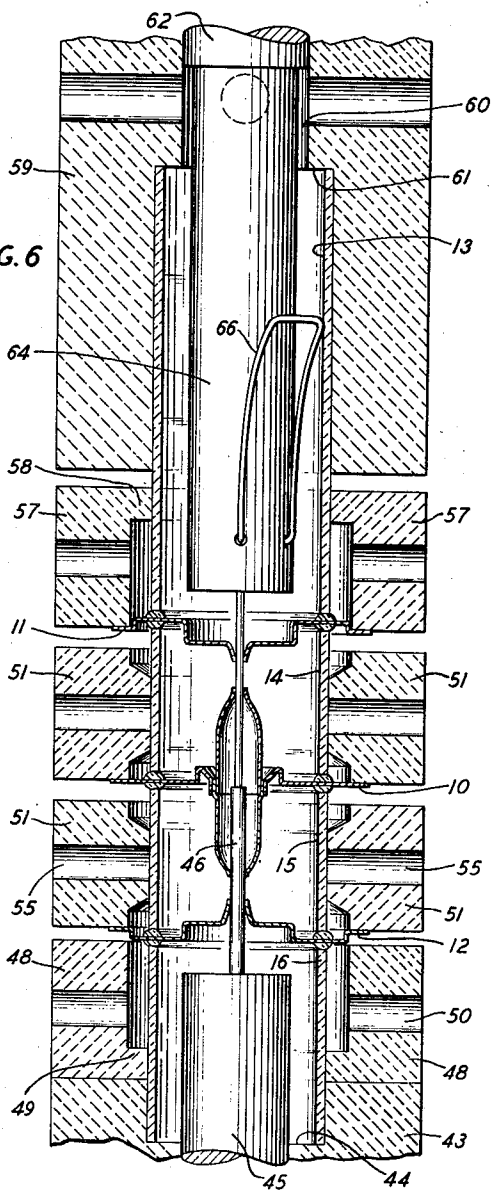


FIG. 6



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2,553,749

SEALING FIXTURE FOR THE MANUFACTURE
OF ELECTRON DISCHARGE DEVICES

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4 Claims. (Cl. 49-1)

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This invention relates to glass-to-metal sealing fixtures for forming the enclosing vessel of electronic devices, particularly such devices suitable for use in ultra-high frequency systems.

In a specific type of device to which this invention is applicable, such as illustrated in Samuel Patent 2,405,611, issued August 13, 1946, a plurality of disc electrodes are held in coaxial spaced relation between tubular sections of glass or ceramic with the intermediate sections hermetically sealed to opposite sides of adjacent electrodes to form the enclosing vessel of the device. The dynamic and physical characteristics of the device and the efficiency thereof are determined primarily by the spacing of the electrodes along the electron propagation path. The dimensions of the internal cavities between the electrodes are important in the determination of the circuitual and electrical constants utilized in the operation of the device in certain ultra-high frequency applications, particularly in microwave velocity variation tubes of the multigap type.

It is essential, therefore, to accurately space the electrodes longitudinally as well as in coaxial relation to insure the highest efficiency in the operation of the device. Since the cooperating electrodes definitely interact with the radio frequency circuit with which the device is associated and primarily determine the wavelength range of the device, it is evident that a high degree of skill is required in the fabrication of the device to attain the desired operating characteristics and to meet the circuitual requirements.

A primary object of this invention is to overcome the difficulties of fabrication of the device, as set forth above, so that such device may be assembled on a mass production basis without the need of highly precise skill on the part of the operator.

Another object of the invention is to insure accurate spacial relation between the electrodes in the device notwithstanding the variables involved in sealing the glass sections between the multiple electrodes.

A further object of the invention is to facilitate the alignment of the electrodes and intermediate glass sections so that fusing of the related components is expeditiously accomplished.

Another object of the invention is to improve the assembly technique whereby the electrodes are automatically spaced and sealed to the glass portions of the vessel during the fusing operation.

A further object of the invention is to expedite the sealing of the electrodes by internal and external positioning fixtures which may be

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readily removed from the finished assembly of the vessel without affecting the spacial relation of the components thereof.

Another object of the invention is to correlate the components of the vessel in stacked relation with the positioning fixtures, in alignment therewith, and holding such relationship during the sealing process by linear guiding means which permit gravitational movement of the components during the shrinkage of the glass during fusing.

These objects are attained in accordance with features of this invention by providing a sealing fixture or assembly whereby the tubular and disc portions of an enclosing vessel for the type of device referred to are simultaneously sealed together in accurate coaxial and longitudinally spaced relation in an expeditious manner to insure predetermined alignment and hermetically sealed joints therebetween. Further, the structure may be fabricated without the employment of precise skill so that production needs may be met with practically no shrinkage loss due to defective seals or disparity in spaced relation of the electrodes in the device. This is accomplished by mounting the disc electrodes and interposed tubular glass sections of the vessel in a cylindrical pile-up stack with the surfaces of the discs abutting against the ends of opposed glass sections and successive discs spaced in series relation longitudinally of the stack. The disc electrodes are centered coaxially by a vertical internal guide member extending through the discs and sections and the glass sections are aligned with respect to the discs by split sleeve spacer members surrounding the glass sections. The spacers and discs are further held in cooperative relation by a plurality of auxiliary posts which maintain the assembly in predetermined relation as a unit or fixture. The unit is placed in a heating oven or enclosure. The edges of the glass sections are in contact with the disc electrodes and are rendered plastic to fuse to the discs and form tight hermetic seals therewith and produce an integrated metal-to-glass enclosing vessel for electron discharge devices. During the sealing operation, the shrinkage of the glass sections is controlled by the external spacer members so that the prescribed spacial relation of the disc electrodes is assured in the final assembly.

A feature of this construction is the simultaneous sealing of a plurality of coaxial transverse electrodes between adjacent cylindrical sections of the enclosing vessel in which all the elements of the vessel are held in axial relation and the sealing operation may be performed in an

expeditious manner without highly skilled labor.

Another feature relates to the simultaneous settling of the glass sections and electrodes in compression sealing relation by a mass at the top of the pile-up to force the plastic glass into sealing engagement with the disc electrodes on opposite sides thereof.

A further feature relates to the accurate spacing of the electrodes during sealing by the external spacer assembly associated with the pile-up so that true alignment is secured between the gaps of adjacent cooperative electrodes when the final assembly is completed.

A further feature relates to the stress relieving properties of the fixture by reason of the slow uniform cooling of the completed seals which avoids subsequent annealing of the glass parts in the completed assembly.

Another feature of the invention relates to the removal of the internal and external spacer components from the fabricated vessel after assembly without endangering the precise spacial relation of the electrodes or affecting the sealing joints between the glass and metal sections of the vessel.

These and other features of the invention will be set forth with more particularity in the following detailed description when considered with the accompanying drawings, in which:

Fig. 1 shows one device in the manufacture of which the sealing method of this invention is employed, the device being shown in cross-section to illustrate the cylindrical sections of the electrodes and glass parts;

Fig. 2 shows the sealing fixture and associated equipment in cross-section, involved in this invention, with the set-up of the disc electrodes and cylindrical glass sections in superimposed relation prior to the sealing of the vessel of the device;

Fig. 3 is a cross-section view of Fig. 2 taken on the line 3—3 to show the interrelation of the combined assembly and specifically illustrating the position of the external spacer elements with respect to the glass sections, in accordance with this invention;

Fig. 4 is a plan view of the base mounting taken on the line 4—4 of Fig. 2 to illustrate the clamping support of the parallel upright rods which center the pile-up in the sealing fixture;

Fig. 5 is an enlarged view in cross-section of one of the disc electrodes showing the preliminary bead seal formed on opposite sides of the rim of the electrode before mounting in the fixture;

Fig. 6 shows the pile-up assembly in enlarged cross-section view to present the relationship of the components, as shown in Fig. 2, prior to the final sealing operation;

Fig. 7 is a perspective view of one of the split spacer elements employed;

Fig. 8 is an enlarged view in cross-section of the upper guide member to illustrate the detailed construction; and

Fig. 9 is a top plan view of the sealing fixture taken on the line 9—9 of Fig. 2.

Referring to the drawings and particularly to Fig. 1, the ultra-high frequency electron propagation discharge device, which represents one form of a multielectrode type device made in accordance with this invention, involves a plurality of disc-shaped apertured electrodes 10, 11 and 12 cooperatively joined to tubular vitreous or glass sections or sleeves 13 to 16, inclusive, to form an enclosing vessel. The glass sections are hermetically sealed to the disc electrodes to accurately determine the spacial relation between

the internal axial gaps 17 and 18 between the intermediate hollow electrode portion 19 and the opposed funnel-shaped portions 20 and 21 of the input and output disc electrodes 11 and 12, respectively. A stem 22 supporting an electron gun 23 is sealed to the end of the glass section 13 and a collector electrode 24 located within the end of an apertured cylindrical shield housing 25 provided with a flange portion 26, is welded to a metallic sleeve 27 hermetically sealed to the glass section 16 of the enclosing vessel. The electron gun 23 includes an internal heater element 28 surrounded by a cathode sleeve 29 having a dished portion 30, preferably coated with emissive material, such as barium and strontium oxides, to serve as a source of electrons when heated to emission temperature. The cathode is surrounded by a concentric shield 31 having a flanged metallic base 32 provided with bent tabs 33. The tabs support an apertured cup-shaped focussing electrode 34 by clips connected to interposed insulating strips of mica 35 which space the electrode 34 coaxially with respect to the cathode from the flanged base 32 of the structure.

The characteristics and efficiency of the discharge device, as above described, and the wavelength range are determined primarily by the spacial relation of the gaps 17 and 18 between the disc electrodes and by the areas of the resonant cavities formed between the walls of the vessel and electrodes. These cavities are cooperatively joined to external cavities in the operation of the device by the coupling of the disc electrodes which form transverse conductive divisions of the enclosing vessel. Accordingly, since the disc electrodes must be accurately joined to the glass sections of the vessel to provide tightly sealed joints therebetween during the fabrication of the device, it is essential to provide an efficient assembly technique which attains the desired relationship of the electrodes in the device and insures positive reproduction without the use of highly skilled glass working operators and in which the integrated metal-to-glass sealed structure of the vessel may be produced on a mass basis without a high shrinkage loss due to defective assembly.

This is accomplished, in accordance with features of this invention, by a sealing fixture or jig and methods of assembly in which all the seal joints between the disc electrodes and glass sections are formed simultaneously in an expeditious manner. Further accurate coaxiality between the multiple gap electrodes and definite longitudinal spacial relation between the several electrodes are secured during the sealing process.

The electrodes are hermetically joined between tubular sections of the enclosing vessel in a sealing fixture, as shown in Fig. 2, wherein all the joints are formed simultaneously and the series spacing of the interposed electrodes is determined by the external spacer members held in true alignment during the settling of the components of the vessel to form the annular seals on opposite sides of the disc electrodes. The resultant integrated vessel accurately aligns the electrodes and insures positive gap clearances between the electrodes so that the highest efficiency is secured in the operation of the device.

The sealing fixture or jig involves a metallic disc base 36 mounted on a central standard 37 attached to a bench or table 38. A clamping assembly 39, shown more clearly in Fig. 4, is superimposed on the base and carries a plurality of guide rods 40, advantageously of highly dielec-

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tric material, such as quartz, extending upright from the base. These rods are clamped in a central notched block 41 and cooperating segments 42, preferably of dense fabricated resinous material, such as "micarta," to secure the rods in accurate parallel relation without imposing tensional strain on the rods which might cause distortion or lateral dissymmetry between the four rods projecting from the base. A cylindrical block 43 of ceramic material, such as "lavite," having an annular recess 44 is centrally fixed on the clamping assembly 39 and fits within the compass of the rods 40. An integral cylindrical projection 45 within the recess of the block has a two-section guide pin 46 extending axially between the rods 40. The lower or larger diameter section of the guide pin fits within the corresponding larger apertures of the funnel-shaped extension 21 of disc electrode 12 and the adjacent lower aperture of the "buncher" section 19 of the intermediate disc electrode 10, as shown in Fig. 1, while the smaller diameter section of the guide pin fits within the upper armature of the section 19 of the electrode 10 and the similar size aperture of the disc electrode 11. The guide pin 46, therefore, insures exact centering of the electrodes with respect to the guide rods 40 which make contact with the periphery or edge of each disc electrode in the mounted assembly. Each disc electrode, as shown in Fig. 5, is provided with a beaded annular glass seal 47, prior to assembly in the final sealing fixture, to provide a glass flux seal intimately joined to opposite surfaces of the metallic disc electrode, which is preferably formed of copper. The flux seals 47 or half-section glass rings fused on the surfaces of the disc portion of the electrode on opposite sides thereof are concentric with the axis of the electrode and provide a sealing joint coaxial with the diameter of the particular cylindrical sections of the glass vessel which are to be joined to the electrodes in the enclosing vessel.

A feature of the invention involves a pile-up assembly of the alternate glass and disc sections of the vessel, which may be more clearly understood from a description of the assembly, as shown in Fig. 6, and the related pile-up combined in the sealing fixture of Fig. 2. Fig. 6 shows the block 43 receiving a glass sleeve or section 16 which fits within the recess of the block, the section being of suitable length to form one end of the device of Fig. 1. A ceramic ring 48, preferably of "lavite," surrounds the sleeve 16 and has an outer diameter equal to the block 43. The inner diameter of the ring is greater than the sleeve 16 except for an inwardly projecting flange 49 which provides a guiding surface substantially equal to the outer diameter of the sleeve 16. The ring 48 is of such length as to provide a spacing, for example of .0625 inch, between the ring and the beaded disc electrode 12 superimposed on the sleeve 16 with the bead seal 47 in contact with the upper edge of the sleeve. The ceramic ring is provided with radial holes 50 through the cylindrical wall to increase the heat radiation during the high temperature sealing process of this invention.

A split collar spacer 51, of material similar to the ring 50, is superimposed on the disc 12 with its bottom surface in abutting engagement with the annular flat surface of the electrode 12. The two semicylindrical components of the split spacer, one of which is shown more clearly in Fig. 7, are provided with inner surfaces 52 which surround and engage the outer surface of the glass

sleeve or section 15 which rests on the top bead 47 of the disc electrode 12 so that the sleeve is coaxially positioned with respect to the axis of the electrode 12 associated therewith. The upper and lower internal rims of the split spacer elements are provided with arcuate grooves or recesses 53 and 54, to form clearance gaps adjacent the bead 47 on the disc electrode and permit the ends of the sleeve 15 to flow in fusing and sealing engagement with the bead on adjacent electrodes during the sealing process. Each part of the spacer is provided with a pair of radial apertures 55 to permit heat radiation similar to the ring 48 and in addition the outer surface of each half of the spacer is provided with longitudinal grooves 56 in spaced relation to coincide with the external guide rods 40, as shown in Fig. 3. The apertures 55 also aid in handling the "lavite" spacer details when hot by suitable tools and in addition these apertures permit the operator to make temperature readings during the fusing operation of the glass by pyrometer sighting methods. The length of the split spacer collar with respect to the sleeve 15 is such that a spacing, for example of .125 inch, is provided between the collar and the next adjacent electrode 10 which is centered on the guide pin. The bead 47 of the electrode rests on the end of the sleeve 15.

As the electrode 10 is placed in superimposed relation in the pile-up assembly, another glass sleeve 14 and a split collar spacer are arranged in concentric relation on the upper surface of the disc electrode 10, the split collar spacer having the same longitudinal relation to its enclosed sleeve so that a spacing of .125 inch is provided between the periphery of the next disc electrode 11 and the top surface of the spacer. When the electrode 11 is centered by the smaller diameter pin of the guide 46, a "lavite" ring 57 is placed on the flat surface of the disc electrode 11 to embrace a long section of glass sleeve 13. The ring 57 is contradisposed in the pile-up assembly with respect to the lowermost ring 48 since an inwardly formed flange 58 engages the outer surface of the sleeve at an intermediate point. The ring is also provided with radial apertures to allow the escape of heat in the assembly. The final external guide element of the pile-up assembly is an elongated "lavite" tubular member 59, also provided with radial apertures, which is formed with an axial bore 60 leading into a larger diameter opening to provide a shoulder 61 which abuts against the upper edge of the sleeve 13 to aid in centering the sleeve. The difference in length between the shoulder 61 and the lower end of the member 59 provides a spacing gap of .0625 inch to the adjacent surface of the ring 57.

While the pile-up assembly has been described in accordance with the showing thereof in Fig. 6, this has only been done to clearly set forth the details of spacing and relation of the components in the assembly. Actually the assembly is shown in Fig. 2, in which the layer build-up of the spacers and sleeves proceeds with the guide rods 40 on the fixture so that as the individual parts are dropped down between the confines of the axial guide 46 and the boundary guides 40, the pile-up accurately registers within the predetermined area of the fixture with the electrodes coaxially and longitudinally positioned with respect to the cooperating glass sections so that very little precision and dexterity is required on the part of the assembler to insure the desired results. It should be noted that the multiple electrodes are accu-

rately centered in the pile-up assembly by providing the guide pin 46 with a large diameter portion to engage the larger apertures in the electrodes 10 and 12 adjacent the gap 18, as shown in the assembly of the device in Fig. 1, while the smaller diameter portion of the pin engages the smaller apertures of the electrodes 10 and 11 adjacent the gap 17, to align all the electrodes coaxially and in series longitudinal relation.

In addition to the centering of the disc electrodes on the rigid stationary guide pin 46 extending along the axis of the fixture, an upper guide rod 62 is slidably fitted in the tubular "lavite" guide member 59 and forms an assembled element therewith. The rod 62 is provided with a head 63 which rests on the top of the tubular guide 59 and is movable therein by the sliding fit of the shank below the head in the bore 60. The lower end of the rod, as shown in Fig. 8, has a tubular portion 64 which provides an internal passage for the guide pin 46, to engage a central guide hole 65 formed in the solid portion of the rod. The guide pin 46 is axially centered at the top of the assembly to insure accurate coaxiality of the disc electrodes with respect to the other components of the sealing fixture. The tubular portion 64 is provided with a lateral U-shaped tungsten spring member 66 anchored in the side wall of the rod and this spring engages the inner wall of glass sleeve 13 to hold the sleeve against the socket in the spacer member 59, and prevent sinking of the sleeve downward during the sealing process. The spring also keeps the slidable rod 62 within the spacer to prevent loss thereof since the spring projects away from the tubular portion of the rod so that the rod cannot be removed through the bore 60 of the guide member.

When the pile-up of electrodes, spacers and sleeves is completed, an aperture retainer ring or cap 67 of insulating material, such as "mica," is placed over the quartz rods 40 to lock the whole assembly in coaxial symmetry, the cap being provided with suitable sockets or an annular groove to receive the free ends of the rods 40. A solid metallic mass or weight 68, in the form of a cylindrical block, for example of steel, is mounted in contact with the head of the guide rod 62 and slidably extends through the ring 67, so that the mass is movable in a longitudinal direction with respect to stationary cap on the fixture. A reciprocally movable standard 69 extends from the bench 33 parallel to the fixture and is provided with a transverse arm 70 at the top which bears against the solid mass 68, the arm being actuated by a handle 71 placed in a convenient position close to the bench for manipulation by the operator. The mass 68 provides a gravity force which initially bears against the assembled elements in the fixture to assure positive contact of the glass sleeves with respect to the beaded disc electrodes. In addition, the weight cooperates with the multiple elements stacked in the pile-up assembly of the fixture during the sealing process, to insure uniform settling of the parts when the ends of the glass sections in contact with the disc electrodes are rendered partially plastic to form the hermetic joints on opposite sides of the disc electrodes. Additional pressure on the pile-up assembly during the sealing may be provided by the operator bearing down on handle 71 against the spring 81.

The sealing of the stacked parts in the fixture is controlled by surrounding the fixture with a bell jar 72 supported above the bench to enclose

the fixture after assembly. The jar is provided with a neck portion 73 at the top to inject a supply of inert gas, such as nitrogen, into the jar to prevent excessive oxidation of the disc electrodes during the high temperature sealing operation.

The heating energy for producing the sealed joints between the discs and glass sections is supplied by a three-section series connected high frequency induction coil of the water-cooled type having an intermediate section 74 surrounding and medially positioned with respect to the disc electrode 10 while the end sections 75 and 76 are positioned above and below the disc electrodes 11 and 12, respectively, and are in coaxial alignment with the section 74. This arrangement of the coil disposes all the metallic disc electrodes within the high frequency heating field of the coil so that the discs may be efficiently raised to sealing temperature with the glass sections. The coil is supplied with heating energy from any suitable source of high frequency to inductively heat the copper disc electrodes to a sufficient temperature so that the glass beads are rendered plastic and by conduction the abutting ends of the glass sections are heated to soften the glass and produce a fusing action in the glass sections to form the seal joints on opposite sides of the disc electrodes simultaneously in the pile-up assembly in the fixture.

During the fusing operation, the glass sections will necessarily shrink or spread adjacent the disc surfaces to form the seals, as shown in the device of Fig. 1. This action is aided by the gravity force of the mass 68 pressing down on the pile-up to insure tight hermetic joints with the disc electrodes and homogeneous fusing of the plastic glass ends with the plastic beads intimately in contact with the surfaces of the electrodes. The shrinkage or settling of the pile-up causes the electrodes to move downwardly until they contact the top surfaces of the respective cylindrical spacers surrounding the glass sections. In order to accomplish the simultaneous sealing of the sections to both sides of the discs interposed therebetween, it is essential that the initial spacing of the pile-up assembly be equalized. This is accomplished by providing double spacing between the split spacers 51 and the adjacent discs 10 and 11, since the interposed glass sections 14 and 15 are required to form seals at opposite ends to the adjacent electrodes, while only a single seal is required between the end sections 13 and 16 with their respective electrodes 11 and 12. The equalized spaced relation of the pile-up assembly, therefore, provides uniform sealing conditions in the respective joints between the discs and glass sections of the vessel.

As the discs are depressed during the sealing process, they are controlled in their longitudinal movements by the height of the spacers surrounding the glass sleeves. When the discs rest on the top surfaces of the spacers as they slide downwardly, the discs are finally gripped between adjacent spacers which determine the internal spacial relation of the juxtaposed ends of successive electrodes in the enclosing vessel. When the multiple seals are formed, the energizing source for the coil is disconnected and the components in the fixture are allowed to cool to room temperature. This is facilitated by the apertures in the spacer elements which permit the confined heat within the structure to escape normally so that strains and stresses are avoided in the fabricated seals of the vessel. The gas sup-

ply is continued during the cooling stage to avoid oxidation and to overcome drafts of air into the bell 72 which might cause fracture of the seals.

The pile-up assembly and the fixture provide an expeditious method of effecting the multiple seals for the enclosing vessel in which accurate coaxiality of the glass sections is maintained and coaxiality of the electrodes is assured. Further, it is obvious that relatively unskilled labor may be employed in forming the intricate sealing assembly with the assurance of high production without material loss as to shrinkage due to defective seals.

After the bell is removed and the fixture disassembled the integrated sealed vessel may be lifted out of the fixture and the end guide 59 and rings 57 and 48 removed by sliding these elements along the glass sections 13 and 16 respectively and parting the split collars 51 laterally from the pile-up without endangering the seals on the completed vessel. While the external end guides may be removed longitudinally of the completed assembly, it is possible to form these guides as split members if so desired. The external spacer elements provide accurate set-up components for the spacing and alignment of the glass and disc sections of the device prior and during the sealing process and also facilitate the breakdown after completion of the seals since these elements are readily removed from the exterior of the vessel without danger of distortion or breakage of the completely sealed enclosing vessel.

Although the invention has been disclosed in connection with a particular form of device having specific shaped disc electrodes, it is, of course, understood that the invention is applicable to other types of metal and glass enclosing vessels employed in electronic devices. For example, the invention may be utilized in connection with the sealing of disc electrodes to tubular glass sections as used in other types of device. With appropriate dimensional changes in the components, the pile-up assembly may be adapted to wholly dissimilar structures having spaced metallic disc portions sealed between glass sections of the vessel. Accordingly, the scope of the invention should be determined in accordance with the appended claims and not limited to the specific disclosure set forth herein. 50

What is claimed is:

1. A pile-up sealing fixture for aligning alternate metallic disc and tubular vitreous portions comprising a base element, a plurality of parallel guide rods extending therefrom, a plurality of collars in longitudinal alignment in registry with said guide rods, a central guide element extending from said base, said guide and collars adapted to coaxially position alternate vitreous portions and metallic discs in pile-up relation, and a weight bearing against the uppermost portions of the pile-up assemblage to press said portions into sealing engagement with said discs.

2. A pile-up sealing fixture for aligning alternate metallic disc and tubular glass portions to

form an enclosing vessel of a discharge device, comprising a base element, a plurality of ceramic guide rods extending therefrom, a plurality of insulating split collars in longitudinal alignment within said rods, said collars having recesses slidably in contact with said rods, a central guide element extending from said base, a cooperating upper guide member associated with said guide element, said guides and collars adapted to coaxially position alternate glass portions and metallic apertured discs in pile-up relation, said collars being shorter than said portions, and a weight bearing against the uppermost portion of the pile-up assemblage to press said portions into sealing engagement with said discs to form a unitary enclosing vessel of cylindrical configuration having portions of said discs projecting from the wall of said vessel.

3. A pile-up sealing fixture for aligning alternate metallic disc and tubular glass portions to form an enclosing vessel of a discharge device, comprising a base element, a plurality of guide rods extending therefrom, a plurality of insulating collars in contact with said glass portions between said metallic discs, said collars being shorter than said portions and being in contact and alignment with said rods, a central guide element extending from said base and in contact with said discs whereby said discs are coaxially aligned with said rods, and a weight bearing against the uppermost portion of the pile-up assemblage to press said portions into sealing engagement with said discs to form a unitary enclosing vessel of cylindrical configuration having portions of said discs projecting from the wall of said vessel.

4. A pile-up sealing fixture for aligning alternate metallic discs and tubular vitreous portions comprising a base, first guide means extending from said base, positioning rings in contact and alignment with said first guide means, said rings being adjacent the vitreous portions and between the metallic discs and said rings being shorter than said portions, second guide means extending from said base interior to said vitreous portions for positioning said discs coaxially with said portions, and means for bearing against said portions to press said portions into sealing engagement with said discs.

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