May 10, 1966 F. P. MANETTI ETAL 3,251,016

ELECTRON TUBE SOCKETS

Original Filed Dec. 11, 1962 4 Sheets-Sheet 1

Fig. 1.

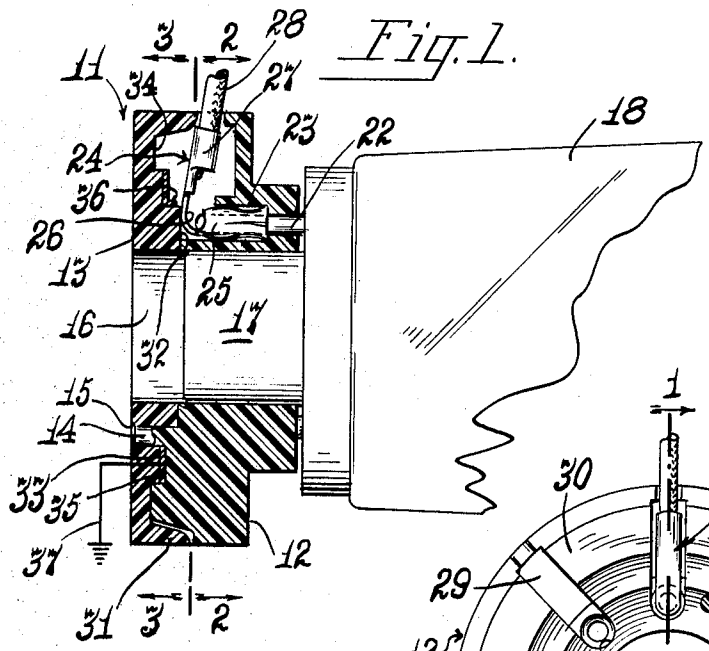


Fig. 2.

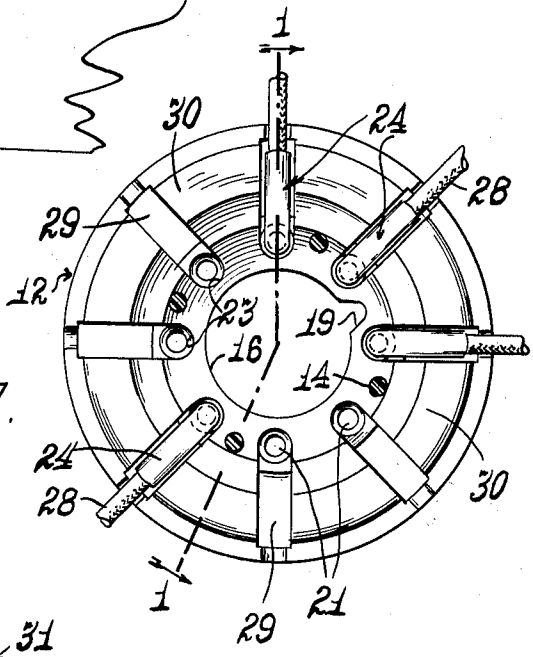
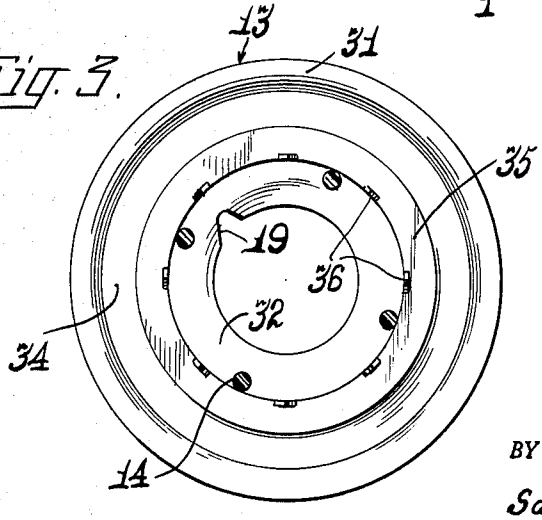


Fig. 3.



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Fig. 4.

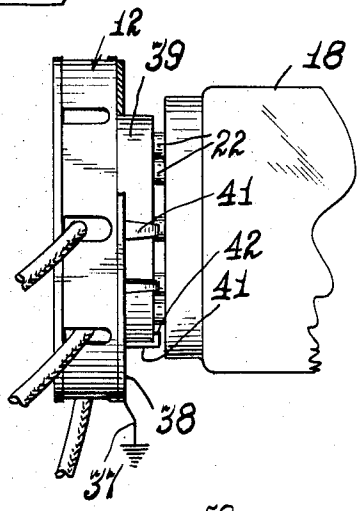


Fig. 5.

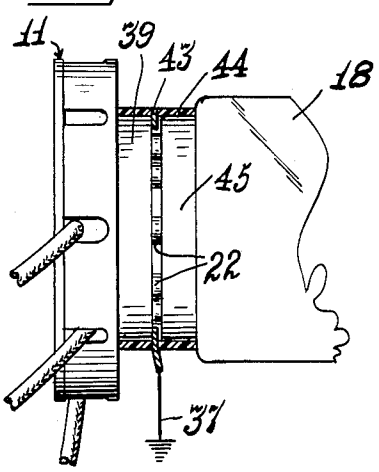


Fig. 6.

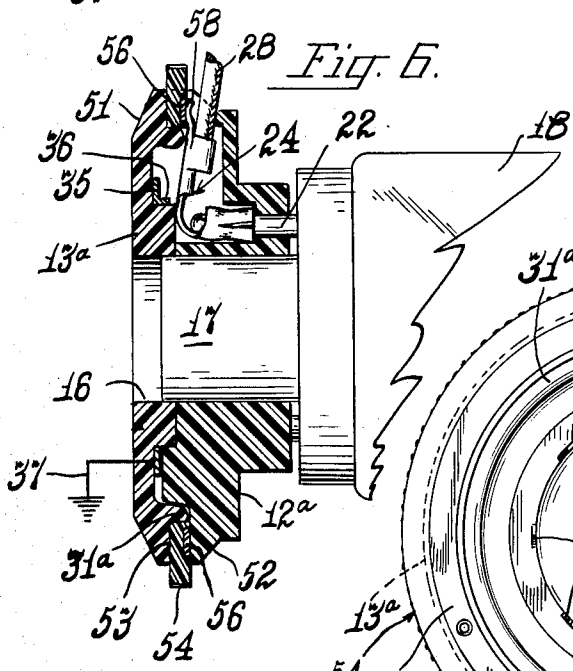
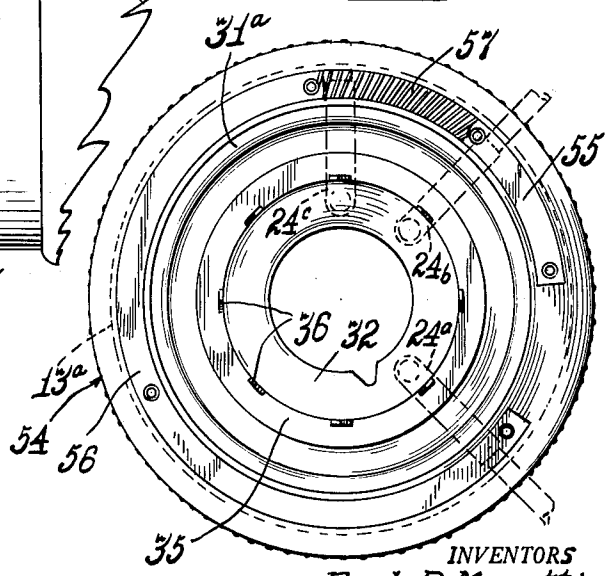


Fig. 7.



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Fig. 9

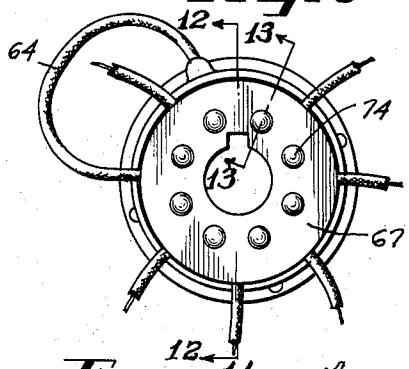


Fig. 8

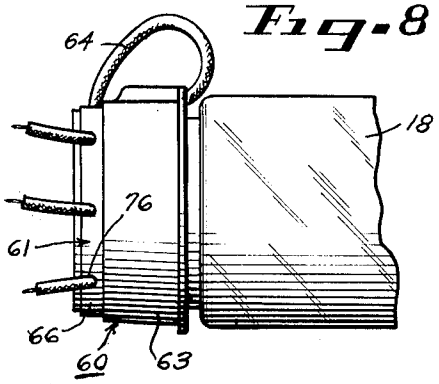


Fig. 11

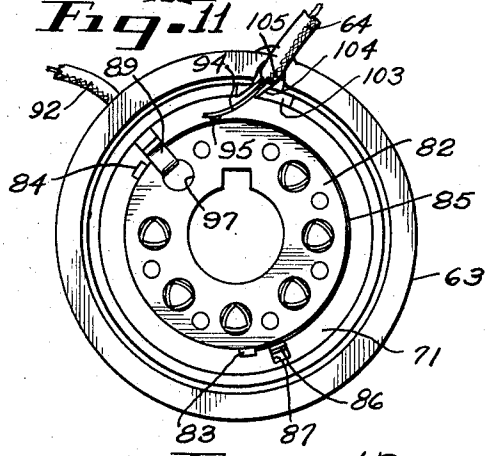


Fig. 10

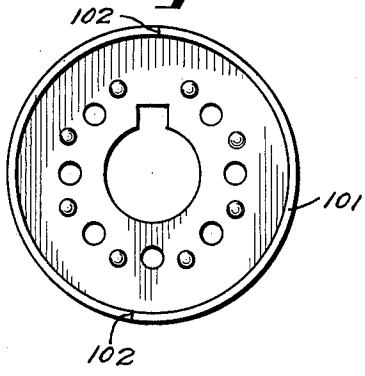


Fig. 12

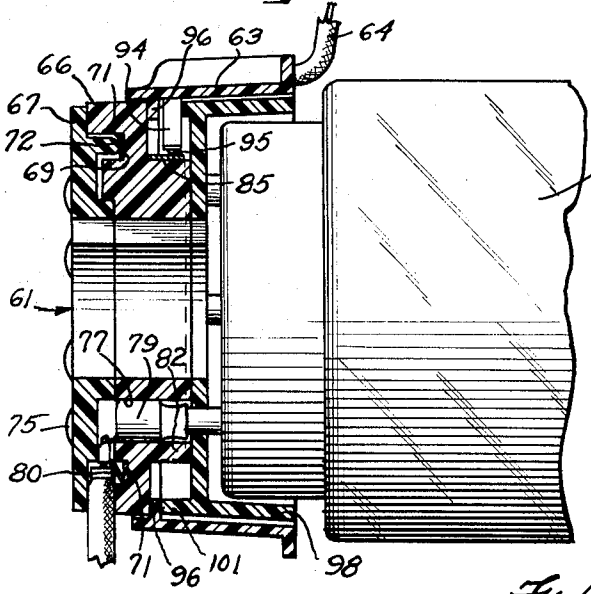
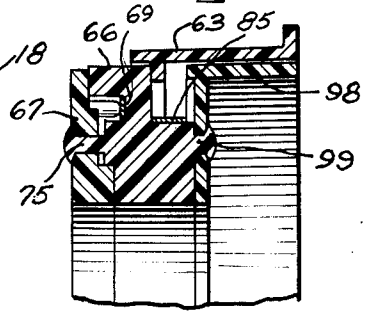


Fig. 13



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ELECTRON TUBE SOCKETS

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Fig. 14

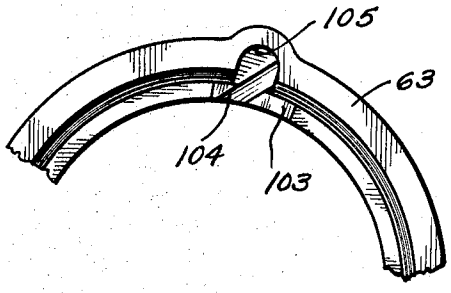


Fig. 15

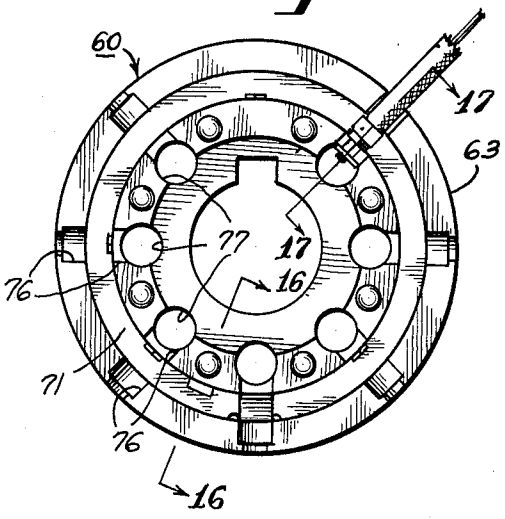


Fig. 16

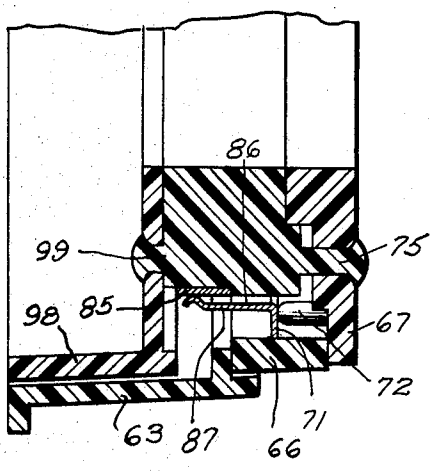


Fig. 17

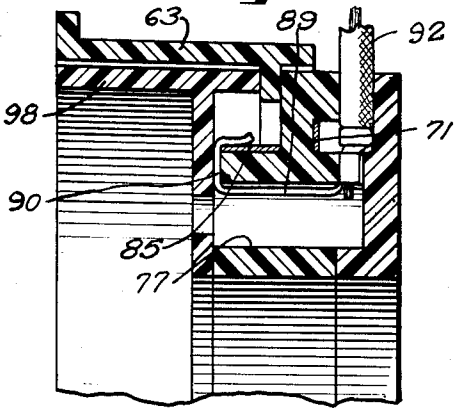


Fig. 18

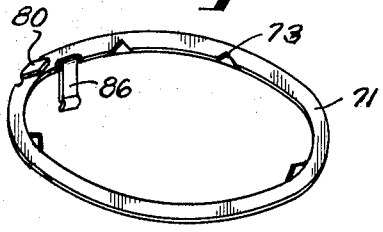
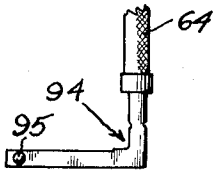


Fig. 19



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United States Patent Office 3,251,016 Patented May 10, 1966

3,251,016

ELECTRON TUBE SOCKETS

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Continuation of abandoned application Ser. No. 245,350, Dec. 11, 1962. This application Sept. 24, 1965, Ser. No. 493,614

10 Claims. (Cl. 338—73)

This invention relates to improvements in electron tube sockets and is particularly concerned with the construction and assembly of a socket especially, but not necessarily, adapted for use with television picture tubes. This application is a continuation of the allowed continuation-in-part application Serial No. 245,350, filed December 11, 1962, in turn based on parent application Serial No. 100,588, filed April 4, 1961, both now abandoned.

Conditions within a picture tube cause occasional arcing of high voltage components within the tube. The high voltage is then conducted through the tube pins, terminal sockets and lead wires to other components in the television set. Protection against such arcing has been in the form of resistors and condensers thus adding to the cost of assembly.

Picture tubes of the type having narrow neck portions have their circumferentially spaced terminal pins so closely arranged as to result in arcing regardless of all known prior attempts to provide an insulation barrier between them or between the terminal sockets for said pins. The socket of the present invention embodies novel means which functions somewhat like an arrester to absorb such high voltage through arcing and convey the discharge to ground or other control for absorption. Such arrester means may be incorporated directly in the socket structure or it may be mounted therein in close association with the tube pins. The incorporation of such arc absorption means makes it possible to incorporate directly in the socket structure, focusing means which heretofore has required protection from momentary high voltage surges originating within the picture tube. The present structure permits pre-setting of the variables within the receiver and should re-setting be required at the time of installation or at any time during the operational life of the receiver it may be accomplished easily and quickly manually.

It is, therefore, an object of the invention to provide a novelly constructed television picture tube socket with novel high voltage arc arrester means.

Another object is to provide a tube socket of the type having a plurality of terminal pin connectors and an associated collector ring common to all or some of said connectors for the absorption of high voltage current through arcing.

Another object is to provide a novelly constructed, easily assembled inexpensive arc arrester socket for electron tubes.

Another object is to provide a novelly constructed and assembled socket for a multi-electrode tube with focusing means incorporated therein.

The structure by means of which the above noted and other advantages of the invention are attained will be described in the following specification, taken in conjunction with the accompanying drawings, showing representative embodiments of the invention, in which:

FIG. 1 is an enlarged diametrical sectional view of one embodiment of a tube socket embodying features of the invention, and in position on a narrow neck television tube, taken substantially along line 1—1 of FIG. 2;

FIG. 2 is a planar view of the socket body, as viewed along line 2—2 of FIG. 1;

FIG. 3 is a planar view of the socket cap and arc arrester, as viewed along line 3—3 of FIG. 1;

FIG. 4 is an enlarged side elevational view of a conventional type socket embodying another form of arc arrester, and showing a television tube positioned therein;

FIG. 5 is an enlarged side elevational view of a conventional type socket and television tube assembly, showing another form of arc arrester thereon;

FIG. 6 is an enlarged sectional view, similar to FIG. 1, showing the new type socket with focusing means embodied therein;

FIG. 7 is a planar view of the cap of the socket assembly shown in FIG. 6, illustrating an exemplary arrangement of the resistance conductors or potentiometer thereon;

FIG. 8 is an elevational view of a focus control socket embodying the present invention and connected to the base of a cathode ray tube only partially shown;

FIG. 9 is an end view of the device of FIG. 8;

FIG. 10 is an enlarged end view of part of the socket of FIG. 8;

FIG. 11 is an enlarged end view looking rearwardly at the socket of FIG. 8 with the member shown in FIG. 10 removed;

FIG. 12 is an enlarged sectional view of the socket of FIG. 8 taken along the line 12—12 of FIG. 9;

FIG. 13 is a fragmentary, sectional view of the socket of FIG. 8 taken along the line 13—13 of FIG. 9;

FIG. 14 is a fragmentary view of the adjustment ring of the device of FIG. 8;

FIG. 15 is an end view of the device of FIG. 8 looking forwardly with the rear end cap removed;

FIG. 16 is a fragmentary sectional view taken along the line 16—16 of FIG. 15;

FIG. 17 is a fragmentary sectional view taken along the line 17—17 in FIG. 15;

FIG. 18 is a perspective view of the arc preventing ring used in the device of FIG. 8; and

FIG. 19 is a plan view of the potentiometer wiper element used in the device of FIG. 8.

The invention, generally, is concerned with the production of novel means to provide for absorption of high voltage current through arcing normally occurring between the television tube pins or the terminal sockets. Such means may be incorporated bodily in the assembly of the tube socket or it may be constructed as an accessory element for mounting on a conventional type of tube socket. The use of such arrester is effective to prevent objectionable high voltage discharge through arcing between the pins of the tube and/or between the terminal sockets and further, makes it possible, for the first time, so far as applicants are aware, to incorporate focusing means directly in the tube socket.

Referring now to the exemplary disclosures in the accompanying drawings, and particularly to the embodiment shown in detail in FIGS, 1, 2 and 3, the socket generally indicated at 11, is comprised of two generally cylindrical sections such as body section 12 and a cap section 13. These sections may be made of any thermosetting or thermoplastic material such as for example polyethylene, or other material having the requisite shape retaining characteristics and dielectric properties such as ceramic, Bakelite, etc. The two sections are concentrically arranged in face to face relation and may be secured together permanently as by means of studs 14 formed integral with one section and extended through aligned holes in the other section and riveted, fused or otherwise secured thereto, as indicated at 15 in FIG. 1. The joined sections have an axial aperture 16 extending therethrough to receive the base 17 of a television picture tube 18, suitably keyed, as at 19, to insure proper placement of said tube in the socket.

The body section 12 has a plurality of mutually spaced holes 21 arranged circumferentially about the axis there-

of to receive a corresponding number of contact pins 22 in the tube base 17. Each of these holes 21 is enlarged in diameter at their innermost ends, as at 23, to receive terminal contacts 24. In practice any selected number of terminal contacts 24 are fitted into selected hole enlargements 23, such number and selection depending upon the electronic characteristics of the tube to be mounted in the socket. These are of course put in place prior to assembly of the cap on the body. Each terminal contact 24 may be comprised of one piece, as shown, including a resilient socket 25 and a substantially flat connecting portion 26 connecting said socket with a lead connection 27 in which lead wire 28 is connected. As shown in FIGS. 1 and 2, the connecting portion 26 and lead connection 27 each lie within a radial channel 29 formed in body 12 with a barrier wall 30 between them so as to minimize high voltage arcing between adjacent terminal contacts 24.

Referring particularly to FIGS. 1 and 3, the cap 13 is formed in its inside surface with a peripheral flange 31 that nests snugly against the peripheral rim of the body 12 and preferably has a circular downwardly offset area 32 surrounding axial opening 16 therein which seats against the flat connecting portions 26 of terminal contacts 24 to hold them firmly in place. An outwardly offset circular area 33 surrounds circular area 32 and the area 34 between said area 33 and flange 31 is further offset outwardly as shown.

The circular area 33 affords a seat upon which is rested a conductor ring 35 having a plurality of prongs 36 mutually spaced circumferential preferably on its inside peripheral edge, and which are disposed perpendicular to the plane of said ring and of sufficient length to locate their terminal ends one closely adjacent to each socket connecting portion 26 with which they align. The spacing between the terminal end of each prong 36 and the related connecting portions 26 constitutes a spark gap which is considerably smaller than the spacing between the terminal contacts. In practice, the conductor ring 35 is connected to ground or to any other element of the installation capable of current absorption. In instances where one of the eelctron tube contact pins 22 is grounded, the ring prong 36 related to it may be in direct contact with the respective connecting portion 26, otherwise a ground lead, diagrammatically illustrated at 37 (FIG. 1), is provided. It is of course evident that the specific relationship between the terminal contacts 24 and said ring prongs 36 may vary in different applications, as when terminal contacts of a type other than that illustrated are used, and that the specific ring-prong structure may be varied to adapt it to sockets constructed other than as illustrated.

FIG. 4 is illustrative of an installation of a ground ring or arrester on a conventional picture tube socket. In this instance a conductor ring 38 is tightly fitted around the axial boss 39 of the socket in surface engagement with the adjacent face of its body 12. This ring carries a plurality of perpendicular prongs 41, responding in number to the number of terminal pins 22 on the tube, that lie against the circumferential surface of said boss, as shown, and have their free terminal ends 42 turned inwardly radially and stopping short of the related terminal pins so as to afford spark gaps for arresting any high voltage arcing between adjacent terminal pins and conveying it through lead 37 to ground or other control for absorption.

In the FIG. 5 disclosure an arrester ring 43 is carried by a tubular member 44 preferably of electrical insulation material which has one end slip-fitted over socket boss 39 and is adapted to receive the base 45 of the television tube telescoped into its other end. As shown, the ring 43 is substantially centrally located longitudinally of tubular member 44 so as to be interposed between the opposed ends of boss 39 and base 45 to position its inner peripheral edge in close spaced relation to the terminal pins and thus provide for high voltage arcing between said pins and ring and ultimate absorption by ground or other control through lead 37.

In both of the foregoing modified structures one or more of the prong terminals 42 or the ring 43 may have direct contact with one or more terminal pins in the event such terminal pin or pins are connected to ground, thus avoiding the need for a separate ground lead such as lead 37.

As noted hereinabove, the presence in the within described structures of novel absorption means for high voltage arcing current renders it possible to incorporate focusing means in the socket assembly and thus minimize production and assembly costs. One embodiment of such combination high voltage absorption and focusing structure is shown in FIGS. 6 and 7. As illustrated, the socket structure is substantially like that previously described and shown in FIG. 1 and like numerals are used to identify corresponding parts. It might be noted at this time that, for purposes to be explained presently, the cap 13*a* is larger in diameter than the previously described cap 13 and it preferably has its outer peripheral surface tapered downwardly, as at 51, so as to present a circumferential edge of reduced thickness. The outside peripheral margin of body 12*a* likewise is tapered downwardly, as at 52, for a like purpose.

The peripheral flange 31*a* on cap 13*a* is spaced inwardly of the outer edge of said cap to provide an annular recess 53 on the cap inside surface in which is mounted a focus adjusting ring 54, fabricated from any suitable dielectric material, such as polyethylene, or other thermosetting plastics or ceramic. The ring 54 has an external diameter greater than the outside diameter of cap 13*a* and it is knurled on its outer perimeter to facilitate manual engagement therewith for rotational adjustment relative to the socket.

The bottom or inwardly disposed surface of said ring 54 carries a pair of electrical conductive segments 55, 56 which preferably are recessed in the surface of the ring and are spaced apart circumferentially so as to afford selective contact with selected pin terminal contacts 24. Segments 55, 56 are interconnected with a resistance element 57, thus constituting the assembly 55–56–57 one element of a potentiometer. In the present embodiment this assembly is arranged to have electrical contact with terminal contacts 24*a*, 24*b* and 24*c* illustrated in dotted lines in FIG. 7, and which constitute the remaining elements of the potentiometer. In the present disclosure terminal contact 24*a* is a ground or filament lead, whereas terminal contact 24*b* is the voltage input or grid lead and terminal contact 24*c* is for the focus control in the tube. In order to establish electrical contact between the selected terminal contacts and the segments, each of these contacts carries a resilient finger 58 (FIG. 6) that has wiping contact at all times with the related segment. More specifically, contact 24*a* has electrical connection with segment 56 at all times and contact 24*b* is in electrical contact at all times with segment 55. Contact 24*c* which has no lead wire connected thereto is adapted to have electrical contact with resistance 57. When adjustment ring 54 is positioned with respect to the contacts substantially as shown in FIG. 7, maximum resistance is afforded. Such resistance may be progressively reduced upon manual rotation of the ring 54 in a counterclockwise direction as viewed in FIG. 7. Rotation of the ring 54 is limited to about 35° in the present instance, although this may be varied to suit installations other than that illustrated. Other terminal contacts than those specifically recited hereinabove can be arranged for inclusion in the potentiometer assembly, such selection depending upon the circuitry required by the specific type of electron tube mounted in the socket.

Focusing by adjustment of means embodied in the socket structure is made possible only because of the presence of the high voltage arrester which definitely prevents damage to the potentiometer.

Referring now to FIGS. 8–19, there is illustrated another embodiment of a television picture tube socket incorporating the novel features of the present invention for eliminating arcing between the tube pins and for enabling manual adjustment of the focus control voltage applied to the focus control contact pin of the associated picture tube **18**. As shown, a socket **60** includes a body section **61** adapted to be fixedly connected to the stem or base structure of the cathode ray tube **18** by means of the tube pins. A manually adjustable ring **63** rotatably surrounds the fixed body section **61** for adjusting the value of the focus control voltage supplied to a flexible wire connector **64** which, as more fully described hereinafter, is in turn connected through the body section **61** to the focus control pin of the picture tube **18**. In use, all of the electrical leads from the chassis connect directly to the fixed body section **61**, and the focusing of the electron beam on the face of the tube **18** is controlled by adjusting the angular position of the ring **63** relative to the fixed body section **61**.

Considering the socket **60** in greater detail and referring particularly to FIG. 12, the body section **61** comprises a main body portion **66** over the rearward face of which an annular cap **67** is fixedly secured. The body **66** is generally cylindrical in shape and has a rearwardly facing circular groove **69** in which a flat conductive ring **71** is positioned and partially held in place by means of a plurality of studs **72** which extend in a forward axial direction from the cap **67** into proximity with the rearward face of the conductive ring **71**. In order to suppress arcing between adjacent contact pins of the tube **18**, the arc suppressor ring **71**, shown in its entirety in FIG. 18, is provided with a plurality of triangular projections **73** extending rearwardly of the ring and having the apex or sharp ends thereof spaced from but in proximity to each of a plurality of tube pin receptacles **79** which connect to the tube pins. The projections **73** are disposed at the radial locations of the pin receptacles **79**. The cap **67** is held in place by a plurality of studs **75** which are integral with the body portion **66** and which extend through suitable apertures in the cap **67**. The rear ends of the studs **75** are riveted or suitably fused over to fix the cap **67** to the body **66**.

In order to accommodate the resilient socket portions of the terminal contacts **79** in which the tube pins **22** are received, the body portion **66** is provided with a plurality of radial slots **76** (best shown in FIG. 8) respectively communicating with a plurality of cylindrical holes **77** (FIG. 12) which are circularly arranged in the base section **60** in alternate relationship with the studs **75**. In normal operation of a television picture tube, one of the tube pins must be grounded, and in the illustrated embodiment of the invention the grounded tube pin is shown as being received in the tube pin receptacle **79** shown in FIG. 12. It will be understood that the arc suppressor ring **71** should be grounded for best operation and, accordingly, it includes a rearwardly extending tab **80** which engages the tube pin receptacle **79** and which thus connects the ring to ground.

On the forward face of the body portion **66** is provided a forwardly extending annular boss **82** having a pair of axially extending stop portions or lugs **83** and **84** (FIG. 11) between which an arcuately shaped resistance element **85** is disposed. The resistance element **85** lies against the arcuate outer surface of the boss **83** and is formed of any suitable resistance material. Preferably, it has a flat, smooth outer surface. In order to hold the resistance element **85** in place on the peripheral face of the boss **82**, a tab **86** on the ring **71**, best shown in FIG. 16, extends forwardly through an aligned aperture **87** and because of its inherent resiliency presses radially inwardly against the resistance element **85** near one end thereof. The other end of the resistance element **85** is mechanically held in place by means of a contact terminal member **89** (see FIG. 17) which extends through one of the unused holes **77** and is reversely bent at **90** over the outer face of the resistance element **85**. Inasmuch as the arc suppressor ring **71** is grounded, the associated end of the resistance element **85** is also grounded. The other end of the element **85** is adapted to be supplied with a voltage connected to the terminal contact member **89** by a suitable wire lead **92**.

In order to couple an adjustable focus control voltage from the resistance element **85** to the particular contact pin **22** of the television picture tube **18** which connects to the focusing control mechanism in the tube, the adjustment ring **63** is rotatably positioned over the forward end of the body portion **66** and has mounted therein a resilient contact finger **94** (shown best in FIGS. 11 and 19) having a spherically shaped pressed-out contact portion **95** which is resiliently biased against the face of the resistance element **85** for continuous contact therewith. Relative rotation of the ring **63** and the body portion **61** thus moves the contact **95** along the resistance element **85** to pick off the selected voltage therefrom.

The adjustment ring **63** is provided with a narrow inwardly directed flange **96** which rides against the forward peripheral face of the body portion **66** and the ring is rotatably held in such position by means of a cup-like holding member **98** which is secured to the body portion **66** by a plurality of studs **99** which are integral with the portion **66** and extend through aligned apertures in the member **98**. The studs **99** are riveted or fused over at the ends to fixedly secure the parts together. A rearwardly extending arcuate flange **101** on the member **98** has a pair of end shoulders **102**, shown best in FIG. 10, which engage an integrally molded stop **103** (FIG. 11) on the ring **63** to limit the degree of rotation of the ring **63**. The stop member **103** is provided with a slot **104** (FIG. 14) opening into an axially extending aperture **105** near the periphery of the ring **63** to receive the wiper finger **94** and to hold it in the position wherein it remains in resilient engagement with the resistance element **85**.

The finger **94** is coupled by means of the flexible wire **64** to the one of the tube pin receptacles **79** which is connected to the focus control pin of the tube **18**.

Although we have described preferred embodiments of our invention in considerable detail, it will be understood that the description thereof is intended to be illustrative, rather than restrictive, as many details of the structures shown may be modified or changed without departing from the spirit or scope of the invention. Accordingly, we do not desire to be restricted to the exact construction described.

We claim:

1. A picture tube socket comprising a planar insulation body having circumferentially spaced sockets therein to receive terminal pins of a picture tube, an electrical conductor ring having its over-all structure embedded in said body with an open gap between said ring and the terminal sockets, and prongs on said ring, each prong being effectively formed adjacent to and spaced from a respective terminal socket, said spacing between related prongs and terminal sockets being substantially less than the spacing between adjacent terminal sockets to afford absorption of high voltage current and to prevent its arcing between the tube terminal pin sockets.

2. A focus control cathode ray tube socket comprising:

a first insulating body section and a focus control section rotatably mounted thereon,

a plurality of tube pin receptacles mounted on one of said sections,

a conductive ring mounted on said one section and having tab portions extending therefrom into spaced apart proximity with said receptacles,

an elongated resistance element mounted on said one section,

a portion of said ring engaging said resistance element and resiliently pressing it against said one section to hold it in place,

and a wiper contact fixedly mounted on the other of said sections for sliding engagement of said wiper contact along said resistance element in response to relative rotation between said sections.

3. A socket for a cathode ray tube television picture tube having a plurality of tube pins including a focus control pin for coupling an adjustable control voltage to a focus control electrode in said tube, said socket comprising:

a body section,

a plurality of tube pin receptacle mounted in said body section for grasping the tube pins of said tube thereby fixedly to connect said body section to said picture tube,

a conductive member supported in said body section and having a plurality of prongs extending therefrom into proximity with said receptacles,

a tab on said conductive member contacting one of said receptacles,

an arcuate resistance element mounted on said section,

a tab on said conductive member engaging said resistance element near one end thereof to hold said one end in place against said section and to connect a voltage to said one end,

conductive means engaging said resistance element near the other end thereof for supplying a voltage thereto,

an insulating control ring surrounding said body section and manually rotatable thereon,

a wiper contact mounted by said control ring,

means resiliently urging said wiper into contacting engagement with said resistance element,

and a flexible conductor connected between said wiper and the one of said pin receptacles which receives said focus control pin,

whereby the focus control voltage applied to said tube is adjustable by rotating said control ring on said body section.

4. A combination socket and focusing device for a television picture tube comprising:

a generally cylindrical body section of insulating material,

a plurality of mutually spaced pin sockets arranged in a common circumferential plane in said body,

an arc suppressor ring of conducting material arranged in said body in parallel relationship to said plane,

a plurality of projections on said ring spaced from but extending into proximity with said socket,

terminal means connected to said ring for supplying a voltage to said ring,

a resistive potentiometer element carried by said body section and extending at least partly therearound,

a resilient projection on said ring pressing one end of said potentiometer element against said body section,

means connected to the other end of said potentiometer element for supplying a voltage thereto,

a focus control adjustment ring rotatably mounted on said body section,

a wiper element mounted in said adjustment ring and resiliently biased against said potentiometer element, and

a flexible lead interconnecting said wiper element and one of said tube pin sockets.

5. A combined socket and focus control for a television picture tube having a plurality of tube pins, comprising:

a body section,

a plurality of tube pin receptacles mounted by said body section and securable to the pins of said tube,

a manually adjustable section rotatably mounted on said body section,

a potentiometer element mounted on one of said sections and a wiper element mounted on the other of said sections, said wiper element and said potentiometer element being resiliently pressed together, and

a flexible conductive lead connected between said wiper element and one of said tube pin receptacles.

6. A focus control cathode ray tube socket comprising:

a first insulating body section and a focus control section rotatably mounted thereon,

a plurality of tube pin receptacles mounted on one of said sections,

a conductive ring mounted on said one section and having tab portions extending therefrom into spaced apart proximity with said receptacles,

an elongated resistance element mounted on said one section, and

a wiper contact fixedly mounted on the other of said sections for sliding engagement of said wiper contact along said resistance element in response to relative rotation between said sections.

7. An electron tube socket having spaced in contact terminals therein to receive terminal pins of an electron tube, an electrical conductor positioned in said socket to be in electrical spaced relation with said pin contact terminals, and means for decreasing the electrical spacing between discrete portions on the surface of said conductor and selected terminal sockets to provide a reduced electrical spacing therebetween whereby high voltage current is absorbed or dissipated thereby, and arcing between the terminal pin sockets is prevented.

8. An electron tube socket as in claim 7 wherein said electrical conductor is grounded.

9. A picture tube socket comprising a dielectric body having circumferentially spaced sockets therein to receive the terminal pins of a picture tube, an electrical conductor enclosed within said body and spaced from the terminal sockets, and means for providing discrete electrical discontinuities on the surface of said conductor whereby a selected arc gap between said electrical discontinuities and an adjacent terminal socket is provided, and arcing between said terminal pin sockets is prevented.

10. A television picture tube socket comprising a planar insulation body having circumferentially spaced sockets therein to receive terminal pins of a picture tube, a generally circular electrical conductor having its over-all structure enclosed within said structure and spaced from said terminal sockets, and means for reducing the effective electrical spacing between discrete portions on the surface of said conductor and selected ones of said sockets to provide a predetermined arc gap between said discrete portions and selected terminal sockets whereby high voltage current is absorbed or dissipated thereby and arcing between said terminal pin sockets is prevented.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,251,016 May 10, 1966

Fred P. Manetti et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 8, line 23, for "in" read -- pin --; line 49, for "structure", second occurrence, read -- body --.

Signed and sealed this 16th day of August 1966.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents