May 7, 1963 L. DREON 3,089,116

SOCKET

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Fig. 2

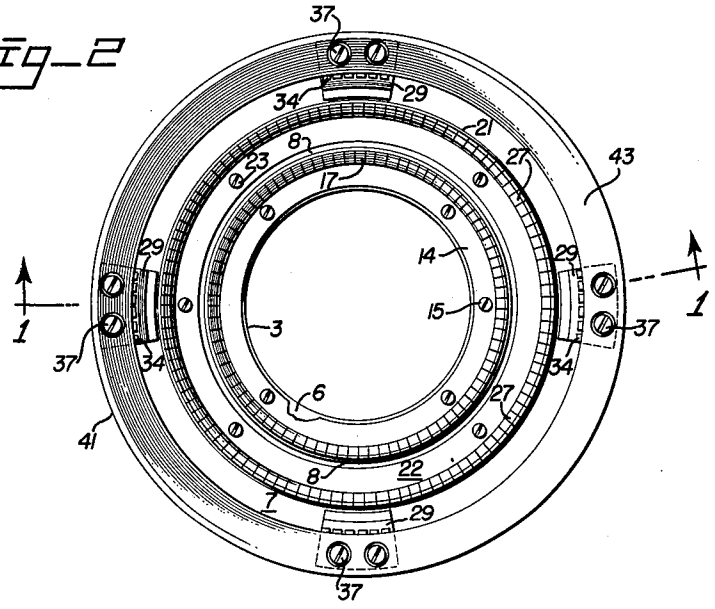
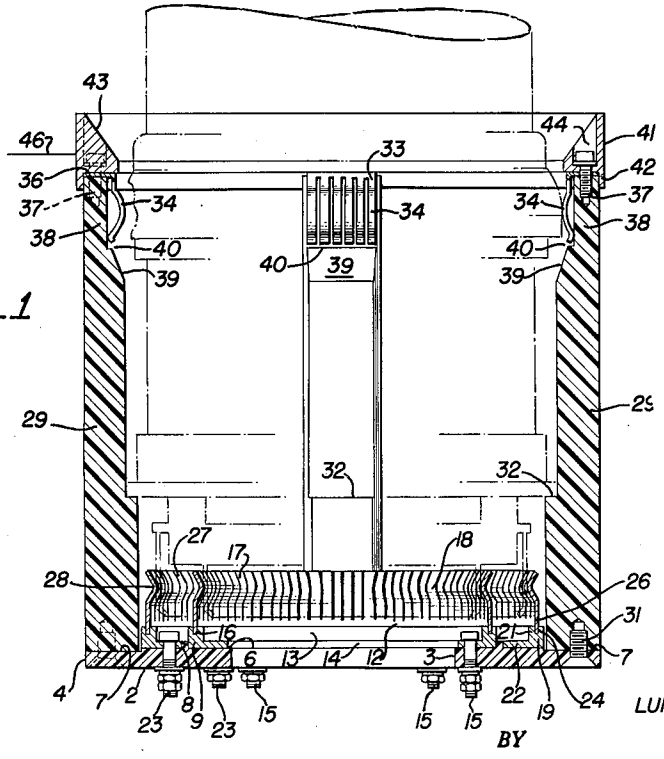


Fig. 1



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SOCKET

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This invention relates to sockets for electron tubes, and particularly to a socket for large klystron tubes.

In the design of sockets for electron tubes there are certain factors of paramount importance. Such factors include facility of fabrication and assembly of the socket parts, economy of manufacture, and replaceability of parts without total disassembly of the socket. Other desirable characteristics include minimum contact resistance between the socket and tube elements, the ease with which the tube may be inserted into the socket, the adaptability of the socket to different size tubes, and the efficiency with which the socket and tube can be cooled during operation.

It is therefore one of the objects of the invention to provide an electron tube socket which is made from easily fabricated and assembled parts.

Another object of the invention is the provision of an electron tube socket which provides optimum cooling characteristics, both for the socket and for the electron tube mounted in the socket.

Still another object of the invention is the provision of an electron tube socket in which individual parts may be replaced without disassembly of the entire socket.

A still further object of the invention is the provision of an electron tube socket which cooperates with a tube to provide minimum electrical contact resistance and maximum mechanical stability for the tube within the socket.

With particular regard to large klystron tube types, sockets tend to be quite large, and in use are immersed in oil for purposes of electrical insulation and cooling. It is therefore another object of the invention to provide a socket for klystron tubes which permits the free flow of a dielectric oil in and around the parts.

Sockets for large klystrons of the type contemplated which are immersed in oil to increase their external resistance to flash-over are difficult to see due to refraction of light through the oil. It is therefore another object of the invention to provide a socket having guide means for guiding the tube into the socket.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be apparent from the following description and the drawings, wherein is disclosed one embodiment of the invention. It is to be understood that the invention is not limited to the particular embodiment described and chosen for illustration, as other embodiments may be adopted within the scope of the appended claims.

In one embodiment, the socket of my invention comprises a base plate adapted to be secured to a supporting structure, and functioning to support the other elements of the socket. Detachably fixed on the base plate adjacent the outer periphery thereof, are a plurality of perpendicular posts. The posts are circumferentially spaced around the outer peripheral portion of the base plate, the spaces between the posts permitting the free flow of oil therebetween. Adjacent the upper end of each post there is a contact plate having resilient fingers adapted to engage a terminal on the tube when it is inserted into the socket. A guide ring, preferably fabricated from brass, and silver plated for maximum conductivity, embraces the upper ends of the posts and secures them against lateral deflection. The guide ring also functions to guide the tube into the

socket between the posts. Detachably secured on the base plate within the confines of the posts are a plurality of collets or contact rings. Each of the collets is provided with an upstanding circular flange fabricated from finger-stock to provide resilient contact fingers adapted to engage a terminal on the associated tube. For ease in assembly the base plate is formed to receive the collets in a prearranged position, thus eliminating the need for jigs. The base plate is preferably annular, to provide a central opening through which oil may flow in and around the base of the tube in the socket.

Referring to the drawings:

FIGURE 1 is a vertical half-sectional view showing the internal construction of the socket. The gun end of an associated tube is shown in dash lines.

FIGURE 2 is a plan view looking down into the socket.

FIGURES 1 and 2 are drawn to a scale approximately one-half actual size.

In more specific terms, the invention comprises a base plate **2**, preferably fabricated from a dielectric material having finely comminuted fibrous material mixed therewith to provide a mechanically rigid plate in the form of an annulus having an inner periphery **3** and an outer periphery **4**. On one side of the base plate adjacent the inner periphery, the plate is provided with an annular rabbeted surface portion **6**. Adjacent the outer periphery of the base plate and on the same side thereof, the plate is provided with a second annular rabbeted surface portion **7**. The two rabbeted surface portions **6** and **7** are concentrically arranged with respect to each other and with respect to the annular base plate. Intermediate the two rabbeted surface portions of the base plate, and defining the outer periphery of the inner rabbeted surface portion **6**, the base plate is provided with a cylindrically extending annular flange **8**. As best shown in FIGURE 1, the surface configuration of the base plate may be conveniently machined or molded to provide the rabbeted surfaces and flange described.

Detachably mounted on the base plate on the rabbeted surface portion **6**, and lying within the cylindrically extending annular flange **8**, is an annular conductive collet including a base ring portion **9** and an upper resilient contact finger portion **12**. The base ring portion of the collet comprises a cylindrically extending flange portion **13** integral with a radially extending flange portion **14**. Cap screws **15** extending through the flange portion of the collet and through the base plate detachably secure the collet on the rabbeted surface portion **6** adjacent the inner periphery of the base plate and function also as a convenient means for electrically connecting the collet into a circuit. The cylindrically extending flange of the collet is provided with a groove **16** into which one edge portion of the contact finger stock **12** is inserted and integrally brazed as shown. The resilient contact finger stock of the collet is preferably fabricated from a single strip of material such as berylium copper formed in a suitable die to provide individual resilient contact fingers **17** circumferentially spaced apart, each finger being provided with an offset portion **18** adapted to form an electrical contact with a terminal of the associated electron tube. As shown best in FIGURE 1, all of the resilient fingers of the contact finger portion terminate in a common plane.

Seated on the base plate on the opposite side of the cylindrical flange **8**, and concentric with the collet **9—18**, is a second annular conductive collet comprising a base ring portion **19** including a cylindrically extending flange **21**, and an integral radially extending flange **22**. As with the collet **9—18**, the base ring **19** is detachably secured to the base plate by cap screws **23** extending through the radial flange **22** and the base, the cap screws functioning also as electrical terminals for the collet. A groove **24** in the cylindrical flange **21** is adapted to re-

ceive the base portion of a length of finger stock 26, into the upper portion of which are struck a plurality of spaced resilient contact fingers 27. As with the contact fingers 17, the contact fingers 27 are each provided with an inwardly extending offset portion 28 adapted to engage an associated terminal portion of the tube inserted into the socket. It will be seen from FIGURE 1 that the contact fingers 17 and 27 terminate in a common plane, and that the collets, including the finger stock portions are coaxially arranged. While in the embodiment illustrated a dielectric base plate has been shown, it will be obvious that if desired, a metal base plate may be used, with the surface configuration machined into the plate. In such a modified construction the base rings of the collets could be insulated from one another by suitable means.

Detachably fixed to the rabbeted surface portion 7 of the base plate adjacent the outer periphery thereof, are a plurality of perpendicularly extending dielectric posts 29. As best seen in FIGURE 2, four such posts are provided. Each is detachably secured to the base plate by a pair of cap screws 31 extending through the base plate and into the bottom end portion of each post. Spaced from its lower end, each post is provided with a shoulder 32 adapted to act as a safety stop to terminate downward movement of the tube when it is inserted into the socket. The shoulder 32 ensures that downward movement of the tube into the socket will not injure the relatively fragile contact fingers 17 and 27.

Secured to each post adjacent its upper end is a contact plate 33, comprising downwardly extending resiliently displaceable contact fingers 34 and radially extending flange portion 36. The flange portion is detachably secured to the upper end of the post by cap screws 37.

As shown in FIGURE 1, the upper end portion of each post is proportioned to provide a reduced section 38 having an inclined portion 39 joined to the reduced section 38 by a shoulder 40, the parts being proportioned to permit flexing and downward displacement or sliding of the end of the finger stock 34 on the post, while at the same time protecting the finger stock from inadvertent engagement with radially projecting tube elements being guided by the post when the tube is being withdrawn from the socket. The finger stock, while engaged with the electron tube, as shown on the right of FIGURE 1, is thus resiliently strained out of its normal position (left side of FIGURE 1) to ensure minimum contact resistance between the finger stock and the tube.

To ensure the rigidity of the posts 29 and to further protect the contact plates, the upper ends of the posts lie confined within a guide ring 41. The guide ring is provided with a cylindrical flange 42 engaging the outside surface of the posts, and with an inclined or conically tapered surface 43 adapted to guide the electron tube into the socket. The parts are proportioned so that the base of the guide ring is wider than the flange 36 to protect the inwardly projecting bend in the contact plate, thus increasing the life of the contact fingers. Depressions 44 formed in the guide ring provide a means of attaching the cap screws 37, which serve to secure both the guide ring and contact fingers 34 to the upper ends of the posts. Because the guide ring comes into contact with the metallic portions of the electron tube, it is desirable that the guide ring be fabricated from a wear resistant and conductive material such as brass. For maximum conductivity, the guide ring is preferably silver plated. It will be obvious to those skilled in the art that while a generally triangular cross-section has been provided for the guide ring, other shapes, such as a cylindrical cross-section, which permit ready access to the interior of the socket, will be just as effective. The guide ring also functions to provide a means of connecting an electrical conductor 46 to the contact fingers 34.

From the foregoing it will be apparent that a rigid and easily fabricated socket for electron tubes has been provided. The posts 29 are conveniently fabricated from cylindrical dielectric tubing sliced longitudinally to provide posts of the desired width. As will be obvious to those skilled in the art, the tubing may easily be machined while it is in its integral form to provide the shoulder 32, the reduced cross section 38 and the inclined surface portion 39 of the post. In this manner the cost of fabricating the individual parts is reduced to a minimum. It will also be obvious that spacing the posts circumferentially provides adequate spacing between the posts for the free flow of oil in and about the socket parts and the tube.

I claim:

1. A socket for electron tubes comprising an annular dielectric base plate, a pair of coaxially arranged collets including resilient contact finger portions detachably mounted on the base plate, a plurality of circumferentially arranged perpendicularly extending dielectric posts each mouted at one end on the base plate, a contact plate detachably mounted on each post adjacent its end remote from the base plate, and a guide ring detachably mounted on the posts and conductively associated with each said contact plate to electrically connect said contact plates and to guide a tube into the socket.

2. In a socket for electron tubes, a base plate, a plurality of circumferentially spaced dielectric posts detachably mounted on the base plate and extending substantially perpendicularly therefrom, each said post having a recess on its inner surface adjacent the end of the post remote from the base plate, and a conductive contact plate detachably mounted on each post adjacent the end thereof remote from the base plate, said plate including a support flange portion extending transversely of the post and a resilient contact finger portion extending longitudinally of the post within said recess.

3. In a socket for electron tubes, a base plate, a plurality of circumferentially spaced posts mounted on the base plate and extending substantially perpendicularly therefrom, resilient contact fingers attached at one end to said posts at the ends of the posts remote from said base plate, said fingers extending along the inner surfaces of said posts with the other ends of the fingers being free to move relative to said posts, each of said posts having a recess on its inner surface along the length covered by said contact fingers, and additional contact fingers in said socket between said base plate and the first-mentioned contact fingers.

4. The combination according to claim 3, in which each of said posts has a tapered surface adjacent the base-plate end of said recess, said tapered surface slanting from said recess inwardly toward the centerline of said base plate.

5. A socket for electron tubes comprising a base plate, a plurality of circumferentially spaced posts mounted on the base plate and extending substantially perpendicularly therefrom, each said post having a recess on its inner surface adjacent the end of the post remote from the base plate and having a tapered surface adjacent said recess, resilient contact fingers detachably mounted at one end to the end of each post remote from the base plate, said fingers extending along the inner surface of the post with the other ends of the finegrs being free to move longitudinally relative to said posts, additional contact fingers in the socket between said base plate and the first-mentioned contact fingers, and a guide ring detachably mounted on the ends of the posts remote from the base plate to rigidly interconnect said posts, said guide ring including a tapered surface converging in the direction of the interior of the socket.

6. In a socket for electron tubes, a base plate, a plurality of circumferentially spaced dielectric posts detachably mounted on the base plate and extending substantially per-

pendicularly therefrom, and a conductive contact plate detachably mounted on each post adjacent the end thereof remote from the base plate, said contact plate including a support flange portion extending transversely of the post and a resilient contact finger portion extending longitudinally of the post, the end of said contact finger portion remote from the flange slidably engaging the post.

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