April 6, 1954 A. JUST 2,674,724

ELECTRICAL CONNECTOR AND VACUUM TUBE SOCKET

Filed March 24, 1950 2 Sheets-Sheet 1

Fig. 1

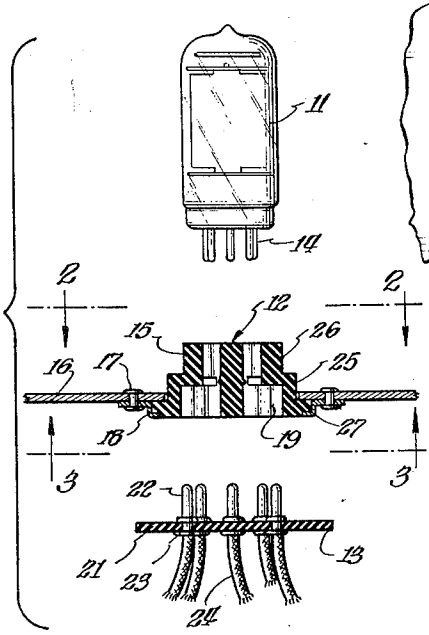


Fig. 2

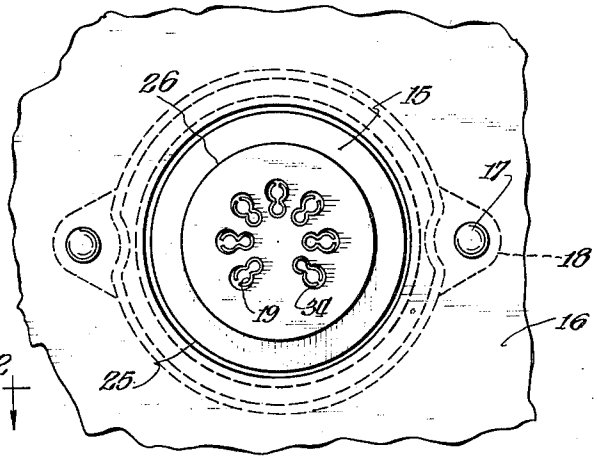


Fig. 3

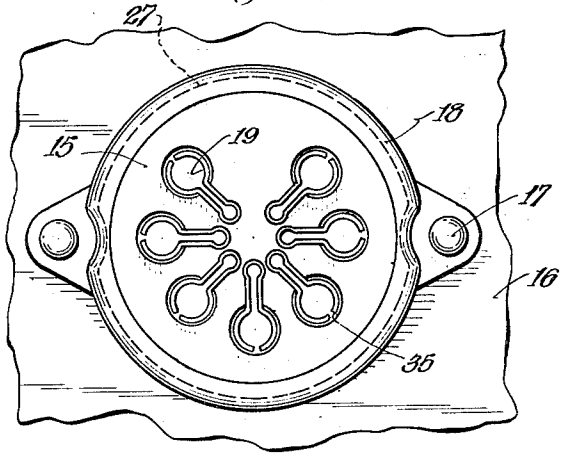


Fig. 4

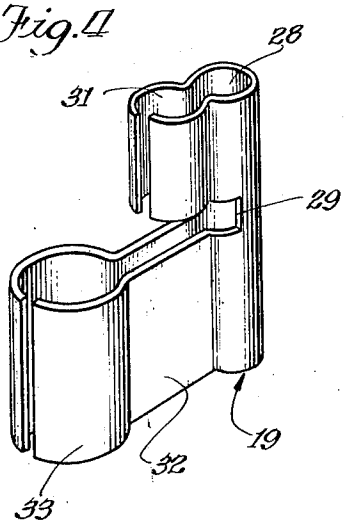
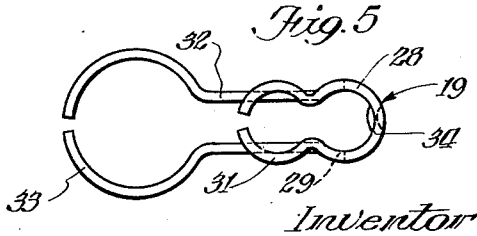


Fig. 5



Inventor:
Alex Just

By: Alois W. Graf
Attorney.

April 6, 1954 A. JUST 2,674,724

ELECTRICAL CONNECTOR AND VACUUM TUBE SOCKET

Filed March 24, 1950 2 Sheets-Sheet 2

Fig. 6

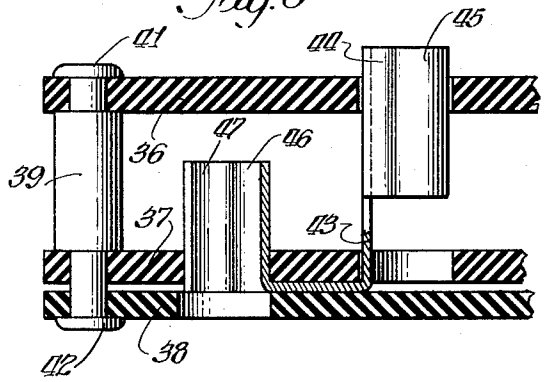


Fig. 7

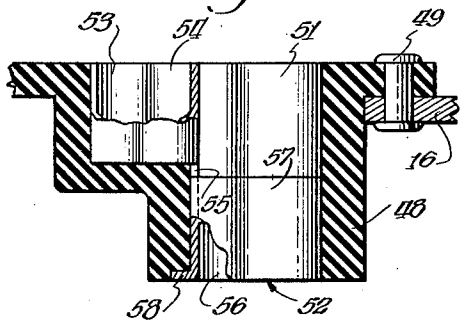


Fig. 8

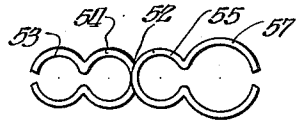


Fig. 9

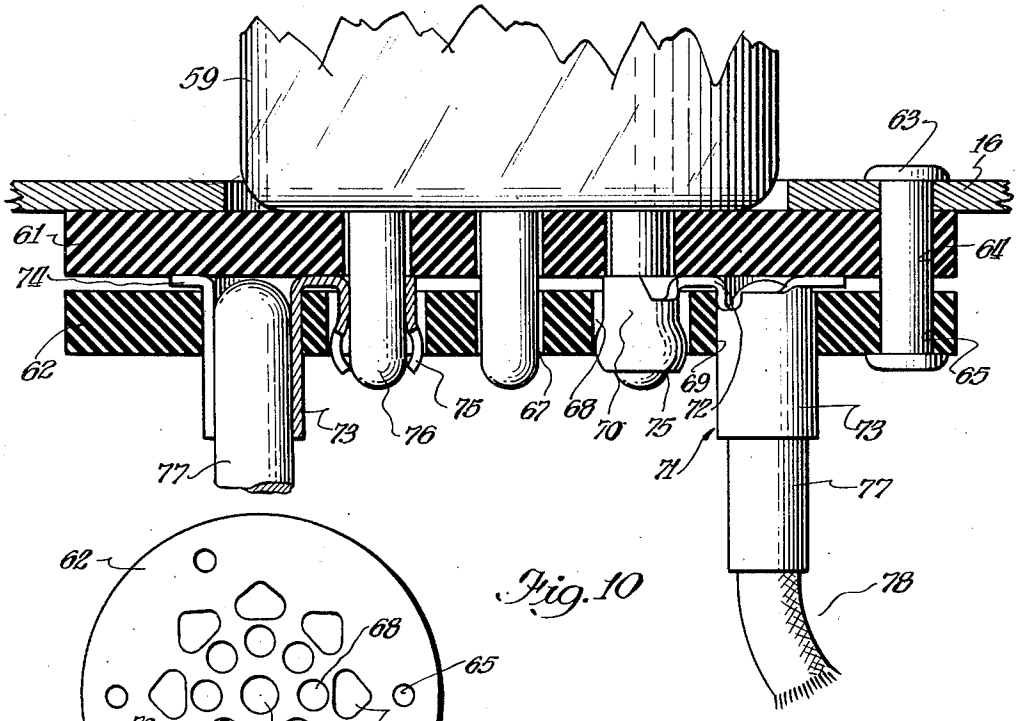


Fig. 10

Inventor:
Alex Just
By: Alois W. Graf
Attorney.

Patented Apr. 6, 1954 2,674,724

UNITED STATES PATENT OFFICE

2,674,724

ELECTRICAL CONNECTOR AND VACUUM TUBE SOCKET

Alex Just, Chicago, Ill.

Application March 24, 1950, Serial No. 151,587

4 Claims. (Cl. 339—193)

1

The present invention relates to electrical contacts and connectors, and more particularly to such contacts and connectors for use in vacuum tube sockets so that conductors need not be soldered directly to the socket element.

Vacuum tube development has shown a tendency to employing smaller envelope tubes such as the miniature tubes. These tubes do not have any bases, but merely have contact pins projecting directly from the glass envelopes. While such an arrangement provides a relatively compact unit, it has been found that many difficulties are encountered in the vacuum tube sockets for such tubes. The relatively small diameter of the pins provided on the vacuum tube make it difficult to obtain proper contact thereon, when it is to be appreciated that mass production methods must be employed in manufacturing vacuum tube sockets. Accordingly, the tolerances in the manufacture of vacuum tube sockets has been set much closer than heretofore, and in spite of this socket trouble is not at all infrequent.

Due to the fact that the vacuum tube sockets on miniature tubes are relatively small, it is not at all unusual for solder and soldering paste to flow into those areas of a metal contact which are to engage the pins or prongs of the vacuum tube. It therefore would be highly desirable to obviate the necessity of soldering directly to the element which grips the pins of the vacuum tube.

In accordance with the present invention, it is proposed to obviate the necessity of soldering conductors directly to the elements of the vacuum tube sockets, and to furthermore provide an arrangement which will produce a considerable saving in the assembly of electrical and electronic devices employing vacuum tubes. Furthermore, the arrangement proposed by the present invention greatly facilitates servicing the equipment and makes it possible to more readily replace a defective vacuum tube socket.

It is therefore an object of the present invention to provide an improved contact or connector element for use in vacuum tube sockets.

A still further object of the present invention is to provide an improved vacuum tube socket.

Still another object of the present invention is to provide an improved vacuum tube socket which requires no solder connections directly thereto.

Other and further objects of the present invention subsequently will become apparent with reference to the following description taken in conjunction with the accompaning drawing:

Fig. 1 is an exploded view of a vacuum tube, a socket, and a connector unit;

2

Fig. 2 is a plan view of a socket shown in Fig. 1;

Fig. 3 is a bottom view of a socket shown in Fig. 1;

Fig. 4 is a perspective view of one of the connector elements employed in the socket of Fig. 1;

Fig. 5 is a top view of the connector element illustrated in Fig. 4;

Figs. 6 and 7 illustrate variations in connector construction and in vacuum tube socket construction all embodying the principles of the present invention;

Fig. 8 is a top or plan view of a connector element employed in the socket construction illustrated in Fig. 7;

Fig. 9 is a view showing another socket construction as employed in use in an electronic equipment; and

Fig. 10 is a bottom view of the lower insulating element used in the socket construction shown in Fig. 9.

Fig. 1 is an exploded view showing a miniature vacuum tube 11 adapted to be mounted in a socket 12, which is arranged to receive a plug unit 13. The vacuum tube 11 has a plurality of contact pins 14 extending below the glass envelope. The socket 12 has a molded body 15 which is secured to a chassis 16 by a plurality of suitable fastening means such as rivets 17.

The rivets 17 may pass through a flange formed in the body 15 of the socket 12 or may engage a metal mounting ring 18. The socket 12 is provided with a plurality of apertures each of which is fitted with a metal contact member 19. A multiple plug 15 consisting of a disc of insulating material 21 carries a plurality of tubular pins 22, held in position by integrally formed collars or beads 23. Each of the plugs or pins 22 is connected to a conductor 24 leading to certain circuit components forming a part of the circuit in which the vacuum tube 11 is arranged to operate. Preferably the molded body 15 has a circular configuration 25 which extended through a circular opening in the chassis 16. The upper portion of the body 15 may have a cylindrical configuration 26 of more diameter. The underside of the socket body 15 may be provided with a mounting flange 27.

Figs. 4 and 5 illustrate in detail the construction of female contact members 19 which are secured in the body 15 of the socket 12. The contact element 19 is formed from a single sheet of resilient material, and has a cylindrical portion 28. The split cylinder 28 is almost cut in half by a transversely arranged slit 29. The upper portion of the split cylinder 28 is integrally connected to a bifurcated cylinder 31. The in-

ternal diameter of the bifurcated cylinder 31 is slightly less than the diameter of one of the contact pins 14 of the vacuum tube 11.

The lower half of the split cylinder 28 is connected by laterally extending parallel strips 32, which are integrally connected to a bifurcated cylinder 33. The internal diameter of the bifurcated cylinder 33 is slightly less than the diameter of any one of the contact pins 22 of Fig. 1 which are adapted to be inserted therein. In order that the contact device 19 may be suitably anchored in the socket 26, there is provided some means such as the dimple 34 although it is to be understood that some other resource or struck-out lug might serve the same purpose. From Fig. 2 it will be noted that the top portion 26 of the socket 12 is provided with suitable openings for receiving the bifurcated cylinder 31, and a portion of the split cylinder 28. These openings 34 are slightly larger than the external diameter of the bifurcated cylinder 31. Similarly as may be seen from Fig. 3 the underside of the socket 12 is provided with openings 35 which are slightly larger in diameter than the bifurcated sleeve 33. Thus the bifurcated sleeves 31 and 33, each must be spread by the contact pin or prong being inserted therein. This provides a cleaning and wiping action which insures proper conductivity at all times. By having a transversely arranged slot 29 extend nearly half way through the cylinder 28 additional spring action is provided by the split cylinder 28. This resilient action prevents permanent distortion or deformation of either of the cylinders 31 and 33. It will also be noted from the arrangement illustrated in Figs. 1, 2, and 3, that the contact members 19 are so arranged in the socket that they enlarge the circle in which the larger pins 22 of the multiple plug unit 13 are arranged. Thus this readily avoids crowding and facilitates both original manufacture and subsequent servicing.

Fig. 6 shows another form of socket which is made up of a plurality of insulating sheet members 36, 37 and 38. Two of these insulating members 36 and 37 are separated from each other by a post 39. The post 39 serves not only as a separation element but also as a rivet since the rivet head 41 holds the member 36 in position. Another rivet head 42 holds the members 37 and 38 closely adjacent to each other. Spaced between the members 37 and 38 is a metal strip 43 which is an integral part of contacting connector elements which are arranged to engage the prongs on a vacuum tube and the pins or prongs of a plug unit. A portion of the metal strip 43 extending between the insulating members 37 and 38, is bent at right angles and is connected to a split cylinder 44 which is integrally connected to a bifurcated cylinder 45. The bifurcated cylinder 45 is the larger one, and it is arranged to be connected to the prongs of a vacuum tube. The other end of the interconnecting metal strip 43 is connected to another split cylinder 46 which is integrally connected to a bifurcated cylinder 47. The latter cylinder is arranged to engage the prongs of a cooperating plug unit. It is believed that it is apparent to those skilled in the art that the cylinders 44 and 45 have an appearance similar to the cylinders 28 and 31 respectively of Fig. 4 and likewise cylinders 46 and 47 may have a similar appearance dependent upon the size of the plug element to be inserted therein. Here again it will be noted that the connector elements which are associated with the plug units carrying conductors to the circuit elements for the vacuum tubes are displaced radially outward from the contact elements such as the element 45 which engages the prongs of the vacuum tube.

Still another socket arrangement is illustrated in Figs. 7 and 8. A molded socket body 48 may be provided with a suitable flange which is secured by a plurality of rivets 49 to an opening in a chassis 16. The molded body 48 of the socket is provided with a plurality of radially arranged openings or apertures 51 each of which is fitted with a contact element 52. The inward portion of the opening 51 in the top thereof has a bifurcated cylindrical portion 53, which is integrally connected to a split cylindrical portion 54. The split cylinder 54 is connected to an interconnecting strip 55 which is joined to a split cylinder 56. The split cylinder 56 is attached to the integrally formed bifurcated cylinder 57. In order that the element might be anchored in the opening 51 a suitable tab or lug 58 is bent inwardly on the underside of the socket 48. The principles governing the dimensions and formation of the connector element 52 are the same as the principles heretofore described in connection with the elements disclosed in Figs. 4 and 5. Thus while the elements disclosed in Figs. 7 and 8 are different in appearance from that disclosed in Figs. 4 and 5, the same theory of operation is employed. The socket arrangement further is such that the cooperating plug pin for the circuit conductors are at a greater radius than the bifurcated cylinders which engage the prongs of the vacuum tube.

Fig. 9 shows a miniature vacuum tube 59 fitted into a socket which is attached to a chassis 16. This socket is formed from a plurality of perforated sheets of insulating material 61 and 62 retained in position by rivets not shown. By means of fasteners such as the rivets 63 passing through openings 64 and 65, in the insulating members 61 and 62, the socket is secured in position on the chassis 16. The insulating member 62 as shown in Fig. 10 is provided with holes 66 for receiving the fastening means or rivets which hold the insulating members 61 and 62 in position. Insulating member 62 also is provided with apertures or openings such as 67, 68, and 69. Each of these related openings 68 and 69 hold in position a contact element 71.

One of the elements 71 is shown in position on the member 62 in Fig. 10 prior to the time that the other member 61 is placed thereover. From this and the disclosure in Fig. 9 it will be seen that each connector element 71 has a strap 72 which fits between the insulating members 61 and 62. One end of the strap 72 is connected to a generally triangular slit member 73 provided with a pair of lugs 74. The pair of lugs 74 also fit between the two insulating members 61 and 62. At the other end of the strip 72 there is formed a cylindrical member 70 which at its lower ends has a spherical configuration 75. The two halves of the spherical end 75 of the socket form contact jaws which engage opposite sides of the tube pin 76. The inner diameter of the cylindrical portion 70 is slightly less than the diameter of a pin 76 so that whenever a pin is pushed therein the spherical half 75 of the socket engages the walls of the pin 76, provide a scraping and cleaning action. It will be noted from the cross-sectional views to the left of Fig. 9 that the inner edges of the contact jaw 75 present a relatively sharp biting edge to the pin

76. The triangular contact members 73 are engaged by prongs or pins 77 which may be carried by a plug assembly such as 13 shown in Fig. 1. In certain cases however the pin 77 might be connected directly to connector 78 as illustrated to the right of Fig. 9. Thus each conductor which is normally soldered to a socket in accordance with present practice may be provided with a pin tip 77 for insertion in the contact element 73. It will be noted that whenever a pin 77 is inserted to a member 73 the walls thereof are pushed outwardly to make firm contact with the inner surfaces of the opening 69 so as to provide good frictional engagement which will preclude the loosening of the pin 77, under any circumstances other than the application of considerable longitudinal force.

While for the purpose of illustrating and describing the present invention certain preferred embodiments have been shown in the drawings, it is to be understood that the invention is not to be limited thereby and such variations and other embodiments are contemplated as may be commensurate with the spirit and scope of the invention as set forth in the accompanying claims.

What I desire to protect by United States Letters Patent is set forth as follows:

1. A female connector contact for receiving from opposite parallel directions two different cylindrical male contacts of electrical apparatus comprising a split cylindrical body divided into two portions by a transverse slit, one portion of said cylindrical body being connected at its longitudinal edges to a bifurcated cylindrical body, the other cylindrical portion being connected to parallel extending metal members connected to another split cylindrical body having its axis displaced parallel to the axis of said first bifurcated cylindrical body.

2. A vacuum tube socket having an insulated housing provided on one side with a plurality of apertures arranged in a circle, and on the opposite side with an equal number of apertures arranged in a larger coaxial circle, passageways each interconnecting an aperture on one side with an aperture on the other side of said socket, and a plurality of connectors positioned in the apertures and passageways of said socket each to interconnect an aperture in the larger circle with an aperture in the smaller circle, each connector comprising an integrally formed member of sheet metal having resilient body portions directly connected to the longitudinal edges of a bifurcated cylinder mounted in an aperture, said body portions being joined to the longitudinal edges of a second bifurcated cylinder by two similar generally cylindrical intermediate portions located in said passageways, said latter bifurcated cylinder being located in another aperture having its axis parallel to the axis of said first bifurcated cylinder, said bifurcated cylinders being arranged as female connector contacts to receive pins from opposite sides of said socket housing.

3. A vacuum tube socket having an insulated housing provided at its top with a plurality of apertures arranged in a circle, and provided at its bottom with a similar number of apertures arranged along radii passing through said first apertures and in a larger coaxial circle, and passageways interconnecting top and bottom apertures for receiving pins from the top and from the bottom of said socket, and a connector positioned in a passageway and two of said apertures to interconnect an aperture on the top with an aperture on the bottom, each connector comprising a sheet metal member having an integrally formed cylindrical portion joined to another cylindrical portion of larger diameter and having its axis parallel to said first portion, said latter portion having a longitudinal slit opposite the junction with said first portion and being aligned with one of said first mentioned apertures, a third cylindrical portion similar to said first portion having its axis in a plane common thereto, and a fourth cylindrical portion of larger diameter having its axis parallel to said first and third portion axes, said fourth portion having a longitudinal slit and being connected opposite to said slit to said third cylindrical portion, said fourth portion being aligned with one of said second mentioned apertures.

4. A vacuum tube socket having an insulated body provided at its top with a plurality of apertures arranged in a circle, and at its bottom with a similar number of apertures arranged in a larger coaxial circle along radii passing through said first apertures, and passageways interconnecting top and bottom apertures along said radii, and a connector positioned in a passageway and two of said apertures to interconnect an aperture on the top with an aperture on the bottom, each connector comprising a sheet metal member having an integrally formed cylindrical portion joined to another cylindrical portion of larger diameter having its axis parallel to said first portion, said latter portion having a longitudinal slit opposite its junction with said first portion, said latter portion being aligned with one of said first mentioned apertures, a third cylindrical portion coaxial with said first portion, and a fourth cylindrical portion of larger diameter having its axis parallel to and in a plane common to the axes of said other portions, said fourth portion having a longitudinal slit and being connected opposite to said slit to said third cylindrical portion, said first and third cylindrical portions being located within said passageway, said fourth portion being aligned with one of the second mentioned apertures whereby said socket is adapted to receive pins from the top and from the bottom in said apertures.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,158,004	Douglas	May 9, 1939
2,304,808	Draving	Dec. 15, 1942
2,462,622	Farrow, Jr.	Feb. 22, 1949
2,550,237	Franklin	Apr. 24, 1951
2,563,775	Del Camp	Aug. 7, 1951
2,567,829	Suthann	Sept. 11, 1951