April 14, 1959 S. COLVIN 2,882,510

SELF-ALIGNING ELECTRICAL CONNECTOR STRUCTURE

Filed Oct. 8, 1953

Fig. 1.

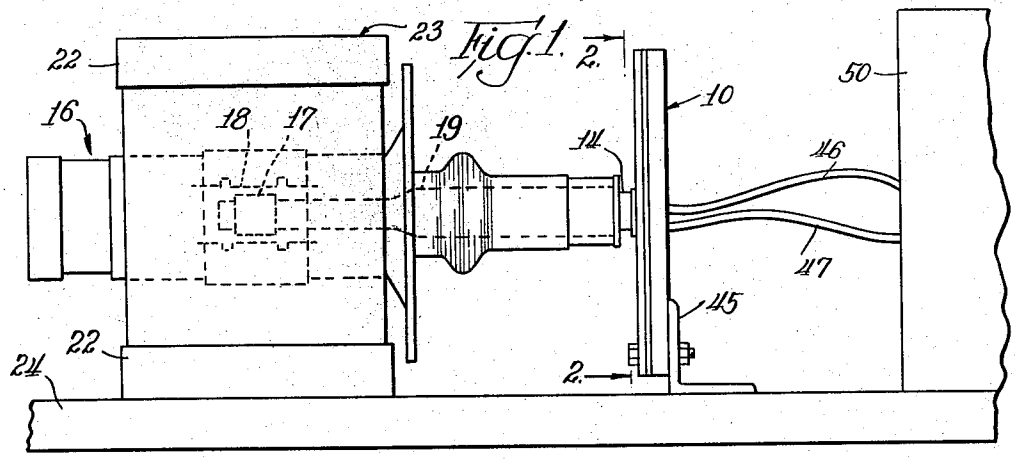



Fig. 2.

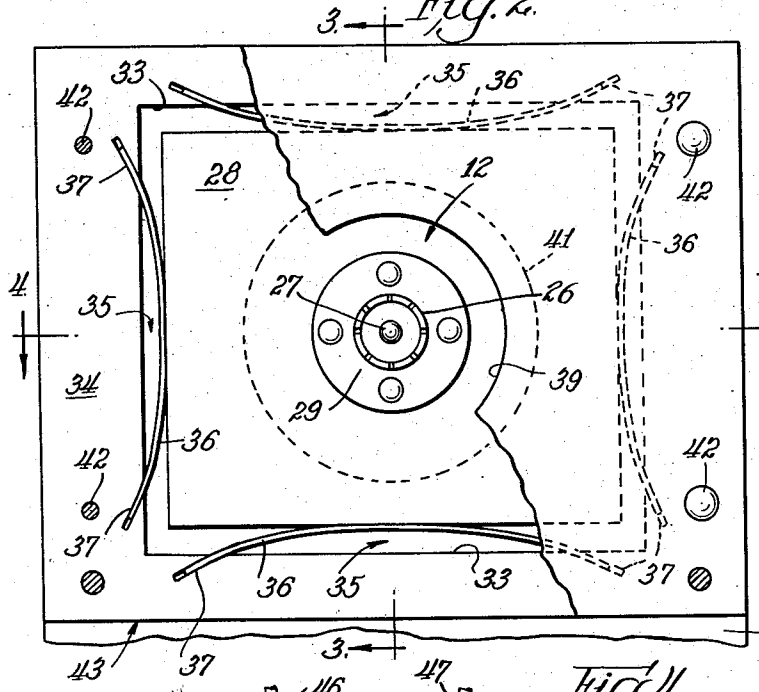



Fig. 3

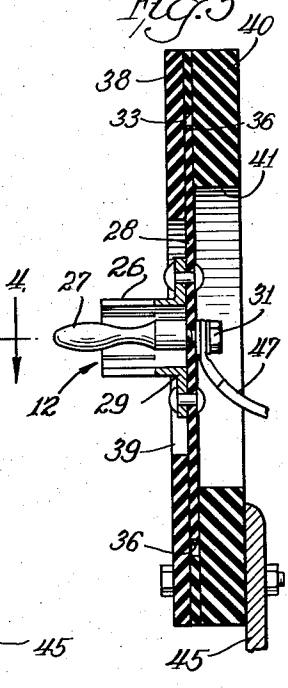
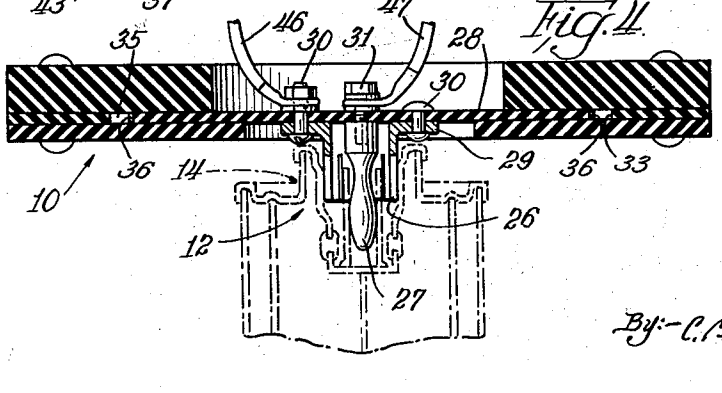



Fig. 4.




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# SELF-ALIGNING ELECTRICAL CONNECTOR STRUCTURE

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2 Claims. (Cl. 339—59)

The present invention relates to a self-aligning electrical connector structure, and more particularly to a device for supporting an electrical connector element for floating movement for making connections to an electronic tube of the magnetron type.

Electronic tubes of the magnetron type have a cathode disposed in an accurately predetermined position relative to an anode and mounted on one end of a stem, the other end of which is supported on a terminal component of the magnetron to which electrical connections are made for applying potentials to the cathode. After fabrication of the tube and during the testing thereof the tube is clamped in a holding fixture and the cathode supporting component of the magnetron is engaged by a connector electrically connected to the testing apparatus for applying predetermined potentials to the cathode. During the testing of the magnetron and the application of relatively high potentials thereto the cathode supporting component of the magnetron is heated and may be distorted by the application of external force thereto and thereby cause the misalignment of the cathode. Hence, it is essential to provide a flexible floating structure for making electrical connections which will not impart any stresses to the cathode supporting component to cause distortion and alter the alignment of the cathode.

It is an object of the present invention to provide a floating, self-aligning mounting for electrical connectors.

It is a further object of the invention to provide an electrical connector structure having the contactors supported against movement axially thereof while permitting free movement laterally thereof and limited tilting movement to permit the self-alignment of the electrical contactors with cooperable connector elements on electrical devices being connected thereto.

One type of apparatus illustrating certain features of the invention as applied to a connector for establishing an electrical connection between a test set and an electrical device to be tested, may include a connector element centrally mounted on a mounting sheet of insulating material which is slightly flexible and is disposed in an aperture of a frame plate of slightly greater thickness than the sheet and in engagement with curved leaf springs interposed between the outer edges of the sheet and the inner walls of the frame plate and supported thereby for free floating movement parallel to face of the sheet. A pair of apertured retaining plates are secured on opposite sides of the frame plate in overlapping relation to the marginal edges of the supporting sheet for holding the sheet and the electrical connector thereon against movement transversely of the sheet while permitting free lateral and a limited rotative movement of the connector element, whereby the connector element may readily align itself with a contact member of an electrical device to be tested and establish electrical connections between the device and a testing apparatus.

Other objects and advantages of the invention will become apparent by reference to the following detailed description and the accompanying drawings illustrating a preferred embodiment thereof, in which



Fig. 1 is a diagrammatic side elevational view of a testing apparatus for testing electronic tubes showing the self-aligning electrical connector mounting;

Fig. 2 is an enlarged face view of the mounting taken on the line 2—2 of Fig. 1 with parts broken away;

Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 2; and

Fig. 4 is a horizontal sectional view taken on the line 4—4 of Fig. 2.

The present connector structure 10 is designed to support an electrical connector element 12 for floating movement to enable the electrical connector to align itself and engage the terminal component 14 of a magnetron electronic tube 16 during the testing of the magnetron. The magnetron has a cathode 17 coaxially aligned within a hollow anode 18 and mounted on one end of a stem 19, which at its other end is bonded to the terminal component 14. During the testing thereof the magnetron 16 is clamped in fixed position between a pair of jaws 22 of a holding fixture 23 mounted on a base 24.

The electrical connector element 12 comprises a pair of contact elements 26 and 27 mounted centrally on a sheet 28 of relatively stiff insulating material capable of being flexed to permit the connector element 12 to be tilted slightly. The sheet 28, which serves as a heat and electrical insulator and may be of various configurations, is shown herein as having a rectangular outline. The contact element 26 is tubular in form and has a flange 29 which is secured to the sheet 28 of insulating material by a plurality of rivets or screws 30 and the contact element 27 is in the form of a pin mounted coaxially within the member 26 and secured to sheet 28 of insulating material by a screw 31. The sheet 28 is disposed in a rectangular opening 33 of a frame member 34 of insulating material having a thickness slightly greater than that of the sheet 28. The opening 33 in the frame member 34 is larger than the sheet 28 and of the same general configuration and provides spaces 35 between the outer edges of the sheet 28 and the inner edges of the member 34. The sheet 28 is yieldably supported on a plurality of flat leaf springs 36, the ends of which slidably fit into slots 37 in the frame member 34. The springs 36 are curved and are held in slots in a manner to cause the middle portion thereof to engage and support the sheet 28 for floating movement in any direction parallel to the face of the sheet 28. Plates 38 and 39 of insulating material having central apertures 40 and 41, respectively, are secured to opposite sides of the frame member 34 by rivets or bolts 42 and overlie the spaces 35 and the marginal shoulder portions of the sheet 28 to prevent movement of the sheet in a direction transversely of the face thereof while permitting free floating movement of the sheet 28 and the connector 12 parallel to the face of the sheet.

An angle bracket 45 fixed to the base 24 supports the connector structure 10 in a predetermined stationary position relative to the holding fixture 23 and with the connector 12 in substantial alignment with the axis of a magnetron tube supported in the holding fixture. Thus, when a magnetron tube is being clamped in the holding fixture 23 and the terminal component 14 is brought into engagement with the connector element 12, this connector element 12 moves freely and aligns itself with the terminal component 14 of the magnetron without imparting any stresses thereto which might effect the misalignment of the cathode.

The contact elements 26 and 27 are electrically connected by leads 46 and 47, respectively, to a test set 50 for applying the proper potentials thereto during the testing of the magnetron.

It is to be understood that the above-described arrange-

ments are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. A self-aligning electrical connector structure comprising a first flat member of insulating material capable of being flexed, a connector element centrally mounted on said member and connectible to a source of potential and to an electrical device, said first member being of sufficient flexibility to permit the connector element to be tilted, a second flat member of insulating material having an aperture similar to and larger than the outline of said first member for receiving said first member therein with spaces therebetween and having slots therein directed obliquely from said aperture, a plurality of leaf springs positioned in said spaces with the ends thereof slidably supported in the oblique slots in said second member and with the intermediate portions of the springs in engagement with said first member for yieldably supporting said first member for movement parallel to the face thereof, and means on one of said members overlying opposite sides of portions of said other member and the spaces between said members for guiding said first member for movement parallel to the face thereof and against movement transversely thereof.

2. A self-aligning electrical connector structure comprising a first flat relatively thin member of insulating material of a rectangular outline, a connector element centrally mounted on said member and connectible to a source of potential and to an electrical device, said first member being flexible to permit the tilting of the



connector element mounted thereon, a second flat member of insulating material having an aperture similar to and larger than the outline of said first member for receiving said first member therein with spaces therebetween and having a plurality of slots extending obliquely from the aperture therein, a plurality of leaf springs positioned in said spaces with the ends thereof slidably supported in the oblique slots in said second member and with the intermediate portions of the springs in engagement with said first and said second members for yieldably supporting said first member for movement parallel to the face thereof, and a pair of centrally apertured flat members of insulating material secured to said second member on opposite sides thereof overlying opposite sides of portions of said first member and the spaces between said members for guiding said first member for movement parallel to the face thereof and agains movement transversely thereof.

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