March 13, 1956 M. L. McLEAN ET AL 2,738,483

ADAPTOR WITH CAM ACTUATION

Filed April 1, 1952

Fig. 2

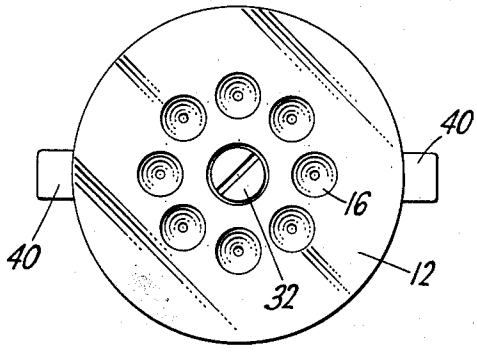


Fig. 5

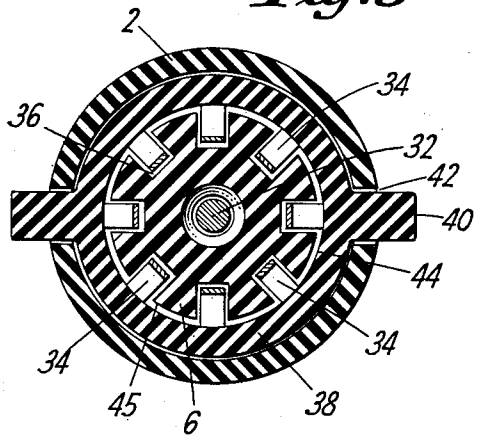


Fig. 1

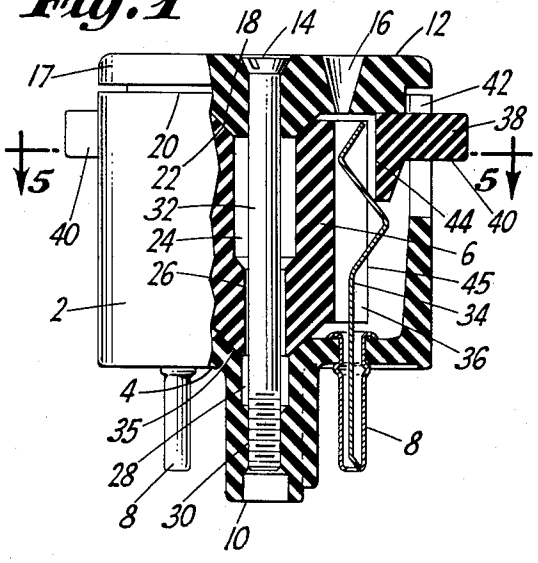
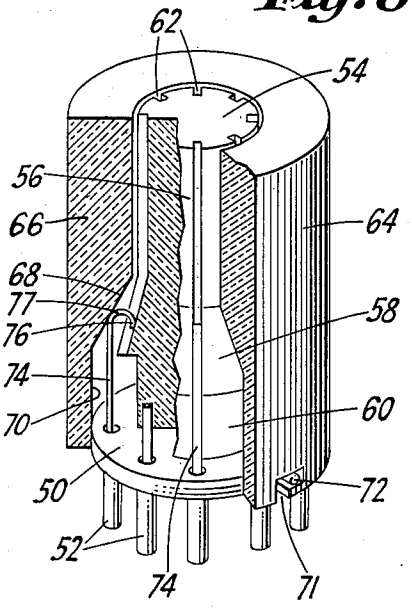


Fig. 6



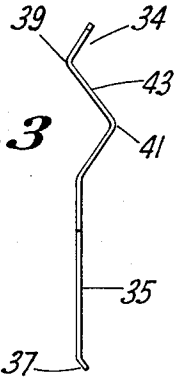


Fig. 3

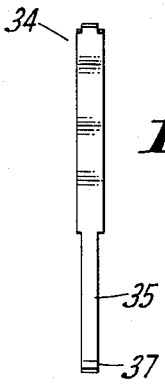


Fig. 4

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ADAPTOR WITH CAM ACTUATION

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5 Claims. (Cl. 339—166)

This invention relates to connectors and more specifically to electrical connectors for use in adapting a radio tube socket to receive vacuum tubes having lead-in connections which are not designed to fit that socket.

One of the features of the rapid growth of the electrical industry and more particularly of the electronic industry in recent years has been the development of a wide diversity of radio tubes having a variety of electrical and mechanical characteristics. As the number of radio tubes has multiplied in type there has been a proportional increase in the difficulty of providing interchangeability, particularly interchangeability of the sort which permits the use of a given radio tube receiving socket with a tube type not originally constructed to fit that socket. Such mechanical interchangeability is particularly desirable in the production and servicing branches of the industry where it is desirable to maintain simple equipments which are readily adaptable to the processing, aging and testing requirements encountered during the process of manufacture of vacuum tubes of many types and during the process of servicing equipments utilizing such tubes.

The present invention relates specifically to adaptors for use in connecting electrical devices having a series of outward extending flexible leads into connector devices designed to receive rigid connecting leads, but the invention may be utilized in adaptors for use with connectors of other types, including connectors utilizing rigid connecting leads.

An object of the invention is to provide an adaptor for receiving electrical leads and for making a firm mechanical and electrical connection thereto.

A further object of the invention is the provision of a vacuum tube adaptor in which flexible vacuum tube connecting leads are readily received and then locked in place, and which in turn may be inserted into a given type of radio tube socket.

A still further object of the invention is the provision of a vacuum tube adaptor for receiving tubes having flexible leads which is simple in mechanical construction and economical to manufacture.

An even further object of the invention relates to a new and improved device for making connection to a vacuum tube having flexible connecting leads.

In accordance with one aspect of the invention an adaptor is constructed by providing a central post member having a base to which is attached a series of suitably located rigid projecting pins adapted to engage a radio tube socket. The central member is cylindrical in general configuration and has a number of longitudinally disposed connecting lead receiving grooves disposed about the periphery of, and generally parallel to, the axis of the cylinder. Disposed within the longitudinal slots are spring-like strip contact members individually connecting the base pin connector members and having projections extending outwardly of the grooves for engaging a locking member. The locking member is an annular ring adapted to fit loosely over the cylindrical central member,

to slide longitudinally along it, and to compress the contact members, thereby forcing them into intimate engagement with the flexible vacuum tube leads.

In the drawings:

Fig. 1 is a view in partial cross section of an adaptor embodying principles of the present invention and illustrating the use of the adaptor to provide connections to an octal type vacuum tube base.

Fig. 2 is a plan view of the embodiment of the invention illustrated in Fig. 1.

Fig. 3 is a side view of the contact strip member shown in Fig. 1.

Fig. 4 is a front view of the contact strip member shown in Fig. 1.

Fig. 5 is a cross-sectional view of the embodiment of Fig. 1 taken through the locking ring at line 5—5.

Fig. 6 is a view in partial cross-section of another embodiment of the invention.

Referring now to Figs. 1, 2 and 5 it will be seen that the invention in one embodiment utilizes as its principal supporting member cup-shaped member **2** having a generally cylindrical wall rising perpendicularly from base or closure member **4** which also serves as a support for fluted central core **6**, socket connecting pins **8**, and insulated key **10**. In general, the configuration and disposition of pins **8** and key **10** will be identical with that of a given type of vacuum tube base and adapted to fit a standard type of vacuum tube socket and to make engagement with the connector receiving clips therein. In the present embodiment of the invention the base construction illustrated is that of an octal tube.

Surmounting the assembly comprising central core **6** and cup-shaped member **2** is cover plate **12** having in it central aperture **14** and circularly disposed conical apertures **16**, the latter being disposed so as to provide guides to aid in the insertion of flexible leads into the adaptor. Cover plate **12** is provided with overriding flange **17** and conical boss **18** to facilitate proper engagement with upper edges **20** and conical recess **22** of cup-shaped member **2** and core **6** respectively. The assembly disc **12**, core **6**, and cup-shaped member **2** is held together by screw **32** passing through aperture **14** in disc **12**, through central bores **24** and **26** of core **6**, through bore **28** of base key **10** into threaded portion **30** of the base key **10**.

Electrical connections within the adaptor are made by means of specially shaped strips mounted within longitudinal slots **36** which are circumferentially disposed on core **6** and lie parallel to the axis of core **6**. Strips **34** which are shown separately in Figs. 3 and 4 are formed of thin resilient sheet metal of a width approximately equal to that of slots **36** provided to receive them. The lower ends **35** of strips **34** are narrowed in order to permit their insertion directly into base contact pins **8** in order to simplify mechanical assembly. A soldered joint may be used to join strips **34** in pins **8** or the tips of **37** of strips **34** may be shaped as indicated in Figs. 3 and 4 to provide contact surface between strip and pins while merely resting in pin **8**. In the latter case, firm contact is assured by the operation of the operating ring **38** as described below.

As will be seen in the drawings it is desirable to shape contact strips **34** in an irregular manner in order to provide contact surface **39** for leads from the vacuum tube being received by the adaptor, and to provide, at the same time, a projecting surface **41** which extends beyond the outer surface of cylindrical bore **6** into the space between the surface of cylindrical bore **6** and the inner surface of cup-shaped member **2**. The projection thus provided serves as a gradually sloping cam surface upon which operating ring **38** may operate.

The structure of ring **38** may be seen by taking Figs. 1 and 5 together. Locking ring **38** is provided with in-

ner cylindrical surface 44 adapted to fit over the outer surface 45 of central core 6. Two lugs 40 are provided on ring 38 and extend outwardly therefrom in opposite directions, passing through slots 42 provided in the wall of supporting cup-shaped member 2. The axial length of inner cylindrical surface 44 is sufficient to provide a useful working surface capable of passing onto projecting portion 41 of spring contact 34 and of applying a constant pressure thereto. Force applied to lugs 40 by the fingers of the user of the device is utilized to provide the necessary motion of ring 38 along the length of core 38, the travel of the ring being limited at the upper extreme by the inner surface of cover plate 12, and at the lower extreme by the bottoms of slots 42 which should be located so as to stop ring 38 with inner surface 44 at rest on the projecting portions of strips 34.

In operation, the invention is used as follows. The vacuum tube to be adapted to fit a socket which would otherwise be incapable of receiving it is placed so that its connecting leads pass individually into conical lead-in orifices 16 in cover plate 12. The leads pass through orifices 16 downward into grooves 36 in central core 6. As the leads pass downward they encounter contact springs 34 at the points of inward flexion 39 provided for this purpose. The leads may slide beyond the contact portions of springs 34 to be received within the entire length of grooves 36, if necessary. After insertion of the tube leads into the adaptor, pressure is applied to outward extending lugs 40 to cause pressure ring 38 to move downward within the adaptor body. As ring 38 moves downward, the inner surface 44 of ring 38 presses against the sloping projection portions 43 of contact strips 34, thereby compressing strips 34 into slots 36 and forcing the inwardly directed knees of contact strips 34 into close and intimate contact with the vacuum tube leads. Passage of ring 38 downward is restricted only by friction between the leading edge or the inner surface 44 of ring 38 and the sloping outer surface 43 of spring contact member 34. It will be seen that, with continued downward motion of contact ring 38, inner cylindrical surface 44 will eventually pass onto the projecting edge of spring contact 34 so that the force of the spring action will be directed in a direction perpendicular to surface 44, permitting ring 38 to rest in the depressed position and at the same time, causing the contact portion of springs 34 to remain in contact with the vacuum tube lead. The friction force thus exerted on the lead serves to retain it in groove 36. Note that even though the spring contact 34 is compressed into groove 36 by the operation of ring 38, the resilience of the contact is not destroyed. The portion of the spring 34 above the projecting knee 41 which extends to contact knee 39 is free to flex and adapted to fit conductors of various dimensions which the adaptor may be called upon to receive.

Release of the vacuum tube from the adaptor is accomplished by reversing the motion of retaining ring 38, accomplished by pressing upwards on the outwardly extending ears 40. Inner surface 44 of ring 38 thereupon becomes disengaged from projecting portion 41 of spring 34, allowing the spring to return to its outermost position. With release of the pressure upon spring 34 the restraining pressure is removed from the contact lead within the groove, permitting withdrawal of the tube leads from the adaptor socket.

Fig. 6 illustrates another embodiment of the invention in which a base disc 50 is provided to support rigid connecting pins 52 in permanent relationship to each other so that they are adapted to fit into a given type of vacuum tube socket. Centrally disposed, and extending perpendicularly from the center of disc 50, is fluted core section 54 having narrow cylindrical upper section 56, tapered central section 58, and cylindrical base portion 60. Slots 62 are peripherally located around core 54, having their innermost surfaces parallel to the longitudinal axis of core 54. Surrounding the core and base assembly is outer shell 64 provided with upper thick wall portion 66, tapered central wall portion 68 and lower narrow wall portion 70. L slots 71 are provided at two or more locations at the lower edge of outer shell 64 and are adapted to engage locking pins 72 which extend outward horizontally from base 50. Located within the hollow space formed between narrow wall portion 70 of shell 64 and cylindrical base portion 60 of core 54 immediately above base 50 are contact spring members 74 which may be made of thin sheet metal. Contact members 74 are adapted at their lower ends to fit within contact pins 52 and are provided at their upper ends with turned over portions 76 which extend into longitudinal grooves 62 and at the same time make contact along the outer curved surface 77 of the turned over portion 76 with the tapered surface of central tapered portion 68 of shell 64.

Operation of the adaptor of Fig. 6 is as follows: Outer shell 64 is rotated about the axis of the device so that pins 72 are moved to the vertical portion of L slots 71, thereby permitting vertical axial motion of outer shell 64 along core 56. With outer shell 64 thus moved upwards the disengagement of spring surfaces 76 from the bottom of slots 62 is insured. The leads from the vacuum tube to be mounted in the adaptor are then inserted into the grooves 62, passing within slots 62 to a point beyond that at which they will be engaged by the inner surface of curved portion 76 of spring 74. Outer shell 64 is then forced downward to the limit of L slot 71 and then turned to lock the shell, causing spring 74 and curved portion 76 of spring 74 to be pressed inward into grooves 62. This motion is accomplished by the cam action of the inner surface of tapered portion 68 of outer shell 64 moving against surface of contact spring 74. Thus curved portion 76 of spring 74 is forced against the lead within slot 62 and, in turn, the lead is pressed against the bottom of slot 62, thereby holding the lead in place. While the turned over portion of spring 74 is compressed by this operation, it is not so compressed that it ceases to serve as a spring—thus providing tolerance for receiving leads of different sizes. Removal of the tube from the adaptor is accomplished by reversing the process; namely, by rotating the shell so as to disengage pin 72 from the horizontal portion of the L slots at its base, and permitting the upward motion of the outer shell which in turn relaxes the curved spring surfaces 76 from their position against the contact leads. The tube may then be removed from the adaptor.

The embodiments of the invention described above are adapted to be constructed out of a suitable insulating material such as a molded plastic and the resulting adaptor is therefore well shielded so that accidental contact with the voltage and current carrying portions of the device is avoided. In the case of the embodiment of Figs. 1 through 5 the only metal parts needed within the assembly are contact pins 8, connector spring strips 34, and central assembly screw 32. In the case of the embodiment of Fig. 6 the metal parts need only be contact pins 52, flexible contact spring 74 and L slot guide pins 72.

While the invention has been described with reference to certain embodiments, it will be apparent to those skilled in the art that other forms of the invention are possible. It is intended, therefore, that the below appended claims should be read and understood with a view to the full appreciation of the spirit of the invention.

What we claim is:

1. In a device for adapting an electrical socket to receive flexible connecting leads the combination comprising a base portion having spaced connector pins adapted to engage and make contact with receiving connectors in a socket, a core disposed adjacent said base formed to provide spaced longitudinal lead receiving slots, resilient conductive strip members extending from said connector pins into the core slots, each of said strip

members being bent to form substantially the vertex of an angle adjacent the slot bottom and the vertex of a second angle external the slot, and a cam member mounted for slidable engagement with the resilient strip portions external the core slots for urging each conductive strip member toward the bottom of the slot.

2. In a device for adapting an electrical socket to receive connecting leads the combination comprising, a core formed to provide spaced longitudinal lead receiving slots, a base portion having spaced connector pins adapted to engage and make contact in an electrical socket, resilient conductive strip members extending from the base connector pins into the core slots, each of said strip members being bent to form a curved lead contact surface concave outwardly adjacent the slot bottom and a curved surface concave inwardly external the slot, and a cam member mounted for slidable engagement with the resilient strip portions external the core slot for urging each lead contact surface toward the bottom of the slot.

3. In a device for adapting an electrical socket to receive connecting leads the combination comprising, a base portion having spaced connector pins adapted to engage and make contact in an electrical socket, a core disposed adjacent said base and formed to provide spaced longitudinal lead receiving slots, resilient conductive strip members extending from said connector pins into the core slots, each of said strip members being bent to form a curved lead contact surface concave outwardly adjacent the slot bottom and a curved surface concave inwardly external the slot, and a cam member mounted for slidable engagement with the resilient strip portions external the core slot for urging each lead contact surface toward the bottom of the slot to provide lead contact wiping action.

4. A device for adapting electrical sockets having a given configuration of pin receiving apertures the combination comprising a core formed to provide spaced longitudinal slots, a base portion disposed at one end of

said core having spaced connector pins adapted to be received by the pin receiving apertures of a given socket, a resilient conductive strip member partially positioned in each slot having one end connected to an associated downwardly and outwardly internal the associated slot connector pin, each resilient strip member being bent and adjacent the slot bottom to form a generally curved contact surface and being bent to form a sloping actuating surface external the slot, and a cam member mounted for slidable engagement with the actuating surface of said strip members for urging the contact surface of the strips toward the bottom of the slots, thereby providing wiping action between the strip contact surface and any lead inserted along the slot bottom.

5. In an electrical connector for receiving leads the combination comprising a core formed to provide spaced longitudinal slots, a base portion disposed at one end of said core having spaced fixed contacts, a resilient conductive strip member partially positioned in each slot having one end connected to an associated fixed contact on the base portion, each resilient strip member being bent internal the associated slot downwardly toward and outwardly away from the slot bottom to form a generally curved contact surface adjacent the slot bottom and being bent to form a sloping actuating surface external the slot, and a cam member mounted for slidable engagement with the actuating surface of said strip members for urging the contact surface of the strips toward the bottom of the slots, thereby providing wiping action between the strip contact surface and any lead inserted along the slot bottom.

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