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DETACHABLE ELECTRICAL CONNECTOR

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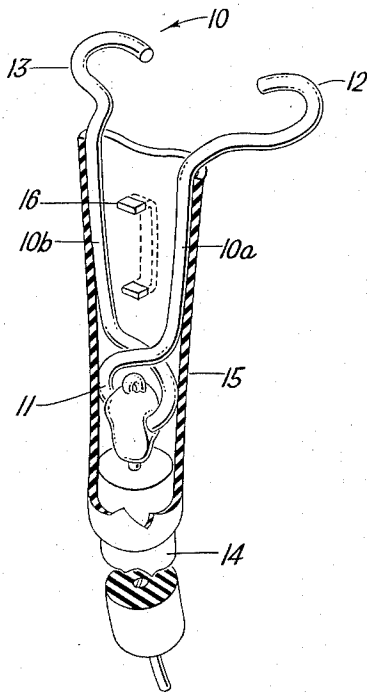


Fig. 1

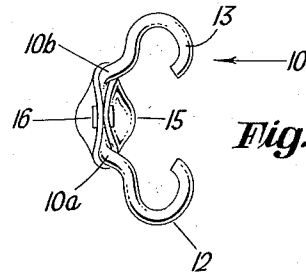


Fig. 3

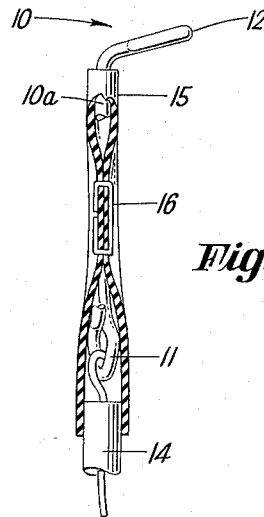


Fig. 2

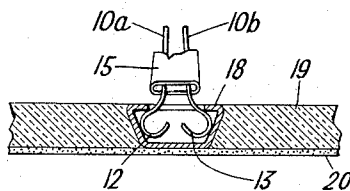


Fig. 4

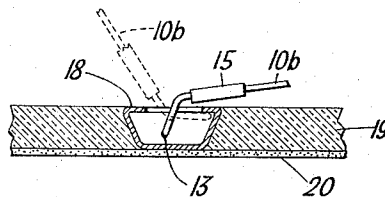


Fig. 5

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3 Claims. (Cl. 339—252)

The present invention relates to detachable electrical connectors, and more particularly to such connectors particularly suited to form the high-voltage anode-terminal connector for a cathode-ray tube.

Certain forms of cathode-ray tubes, particularly television picture tubes, include a final or second anode comprised either by a metal conical shell in the case of metal picture tubes or by a conductive coating formed on the inner surface of the flared envelope portion of the glass bulb of an all-glass picture tube. For purposes of detachably connecting this second anode to an external high-voltage energizing source, the all-glass picture tube has sealed through the wall thereof a female terminal in the form of a conductive cup with a flared base portion and narrowed mouth portion. A similar terminal cup is conventionally provided on a flexible conductive strip mechanically secured in electrical contact with the metal shell of a metal picture tube.

The anode cup terminal last described has heretofore been used in cooperation with a detachable electrical connector (connected to the high-voltage energizing source) usually having a snap fastener type of construction. This form of connector is constructed of several assembled parts and includes a cup-shaped conductive member with serrated sides forming a plurality of resilient fingers which flex inwardly upon engagement or disengagement of the connector with the anode cup terminal. The process of forming this type of connector in one or more steps by a suitable machine limits the material of the resilient fingers to one which is only three or four numbers hard. As a result the fingers are flexed in excess of their elastic limit upon the first use of the connector and become permanently deformed, the amount of deformation increasing to such extent upon continued usage that the connector very soon loses its critical configuration required for a close firm fit with the anode cup terminal. This, of course, has the serious disadvantage that a firm low-resistance electrical connection is no longer possible, and the resultant resistance of the connection is both higher and of inconsistent value. The connection is then subject to arcing with consequent burning of the terminal and contact materials, and may cause the undesirable creation of electrical interference and noise in the associated electrical apparatus with which the cathode-ray tube is used. This form of connector must be used in coaxial relation to the cup terminal, and any lateral strain on the connector tends to break the connection rather easily particularly after the resilient fingers have become deformed as above explained.

There is the further disadvantage, common to this and other similar forms of prior electrical connector, that it is difficult to construct the connector without exposed relatively sharp edges which if present are apt to cause corona discharges and the latter are known to be detrimental to the proper operation of the cathode-ray tube and associated apparatus.

It is an object of the present invention to provide a

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new and improved detachable connector which avoids one or more of the disadvantages and limitations of prior connectors of the type described.

It is an additional object of the invention to provide a novel detachable electrical connector which is free from sharp edges and thus one having minimized tendency to generate corona discharges in high-voltage applications.

It is an additional object of the invention to provide a new and improved detachable electrical connector which is characterized by a uniform and consistently firm electrical contact with an associated terminal member over prolonged periods of usage and after hundreds of times of connecting the connector to and disconnecting it from a cooperating electrical cup terminal.

It is yet another object of the invention to provide a novel detachable electrical connector of simple and inexpensive construction, and one which may be readily fabricated on a wire-spring forming machine of such simple construction and operation that desired changes from time to time of one or more parameters of the connector may be rapidly and cheaply accomplished.

For a better understanding of the present invention, together with other and further objects thereof, reference is made to the following specification and the accompanying drawing in which:

Fig. 1 illustrates in perspective view, partly cross-sectioned, an electrical connector embodying the present invention;

Fig. 2 is a side elevational view, and Fig. 3 a plan view, of the connector; and

Figs. 4 and 5 illustrate the manner in which the electrical connector cooperates with an associated electrical cup terminal.

Referring now more particularly to Fig. 1, an electrical connector embodying the present invention comprises a member 10 of resilient electrically conductive material such as suitably heat-tempered low-carbon steel of which so-called music or piano wire is a good example. The member 10 is conveniently formed by bending operations performed upon a single piece of wire and is generally of U-shaped configuration having leg portions 10a and 10b. The latter are resiliently joined at one end by a closed soldering loop 11 and are terminated at their opposite ends in individual loops 12 and 13, conveniently of open C-shaped configuration diverging outwardly with respect to each other but opening toward one another. As shown more clearly in Fig. 2, the end portions 12 and 13 generally lie in a common plane which forms an obtuse angle to the plane of the leg portions 10a and 10b, an obtuse angle of 120° being a representative value.

One end of an insulated conductor 14 is inserted through the soldering loop 11 and soldered in place mechanically and electrically to join the wire to the connector. A flexible sleeve 15 of insulating material (such as a seamless plastic tubing) may enclose all of the connector with the exception of the end portions 12 and 13, and may be fixedly secured in place by a wire staple 16 projecting through and crimped upon opposing sides of the sleeve 15 to pull the sides together. Alternatively, the sides of the sleeve may be brought together and held by a suitable adhesive or the use of heat bonding or the like.

Fig. 3 shows more clearly the outwardly diverging configuration of the end portions 12 and 13. Fig. 4 illustrates the manner in which the connector detachably engages a cooperating anode cup terminal 18, of conventional configuration, which is hermetically sealed through the glass wall 19 of a cathode-ray tube in electrical engagement with the latter's final or second anode 20 formed conventionally as a deposit of colloidal graphite.

Before insertion of the connector into the cup terminal 18, the leg portion 10a and 10b are normally at a position of rest with appreciably greater spacing than they have after the connection has been completed. Thus the leg portions 10a and 10b must be manually squeezed together during insertion of the connector into the cup terminal 18, and thereafter spring apart to exert substantial lateral force against the sides of the terminal 18. Since the member 10 is formed as a wire bending operation, and thus permits the use of a wire material such as spring steel or beryllium copper having a large number of hardness, the leg portions 10a and 10b may be flexed many hundreds of times without any sign of fatigue or deformation. This fact ensures consistently firm and adequately large engaging force of connection with consequent low value of contact resistance even after hundreds of times of making and breaking connection.

As will be more clearly evident from Figs. 4 and 5, the rounded C-shaped loops 12 and 13 of the connector pivotally engage the anode cup terminal 18 so that a consistently reliable connection is made even though the connector is pivoted from the position shown by solid lines in Fig. 5 to the position indicated by broken lines or in operation is used at any of these positions. Usually the connector will be used in the position shown in solid lines in Fig. 5 so that any mechanical strain on the connector will be exerted longitudinally of the leg portions 10a and 10b, thus minimizing any tendency of the strain to break the connection. The connector when engaging the anode cup terminal 18 from any angle provides a firm electrical and mechanical connection, and this is true over prolonged periods of operation and after repeated operations of making and breaking the connection.

From the above description of the invention, it will be apparent that a detachable electrical connector embodying the invention is of simple and inexpensive construction, may be of small and relatively compact size, and is readily adaptable to mass scale production. Nevertheless its construction is such as to provide a consistently firm electrical and mechanical connection with extreme ease of manual attachment or detachment. The connector being essentially constructed of wire-stock material is readily fabricated of a resilient material which does not readily fatigue or deform after countless attaching and detaching operations. Further, the construction of the connector involves no sharp corners thus minimizing or avoiding any tendency of the connector to produce corona discharges. The relatively simple configuration of the connector enables it to be easily and readily fabricated on a wire-spring forming machine so that its size and configuration may be easily and cheaply changed from time to time as desired without need for expensive and time consuming retooling and machine set-up operations.

While there have been described what are at present considered to be the preferred embodiments of the invention, it will be apparent to those skilled in the art

that various changes and modifications may be made therein without departing from the invention. Consequently, the appended claims should be interpreted broadly, as may be consistent with the spirit and scope of the invention.

I claim:

1. A detachable electrical connector comprising a member of resilient electrically conductive material having spaced leg portions resiliently joined at one end for reduced-spacing flexion during contact engagement manipulation, said leg portions being terminated at their opposite ends in individual outwardly flaring circular connector engagement loops each lying generally in a plane forming a substantial angle with the associated leg portion and adapted to provide a pivotal biased connector engagement with the inner walls of a generally cup-shaped electrical connector member.

2. A detachable electrical connector comprising a generally U-shaped member of resilient electrically conductive material having spaced leg portions resiliently joined at one end for reduced-spacing flexion during contact engagement manipulation, said leg portions being terminated at their opposite ends in individual generally C-shaped contact engagement loops each lying approximately in a plane forming a substantial angle with the associated leg portion and adapted to provide a pivotal biased connector engagement with the inner walls of a generally cup-shaped electrical connector member.

3. A detachable electrical connector comprising a continuous resilient electrically conductive wire drawn member of substantially uniform cross section, a lead wire covered by a sheath of insulating material connected to said member, and an insulating tubular sleeve, said wire drawn member having spaced leg portions extending from a substantially closed resilient loop for reduced spacing flexion of said leg portions during contact engagement manipulation, the leg portions terminating in contact engagement sections flaring outwardly from the longitudinal axis of the associated leg portion, said sleeve positioned to surround the resilient loop and substantially enclose the leg portions, said contact engagement sections being formed to provide pivotal biased contact with the inner walls of a generally cup-shaped electrical connector receiving member.

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