

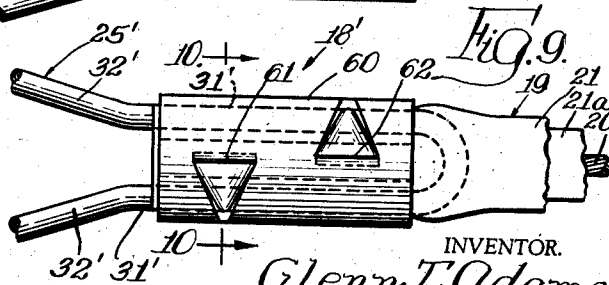
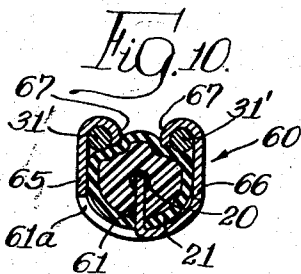
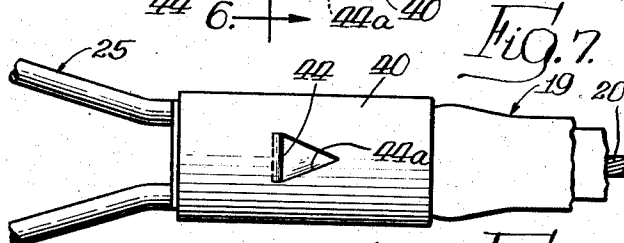
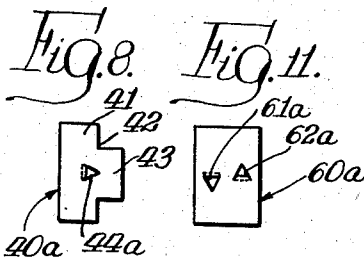
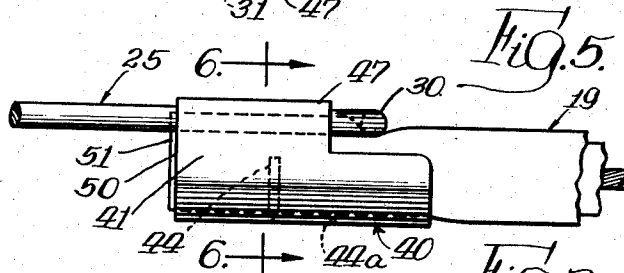
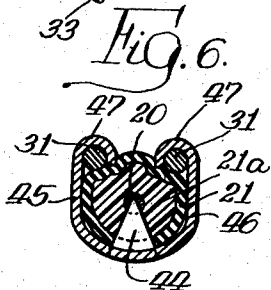
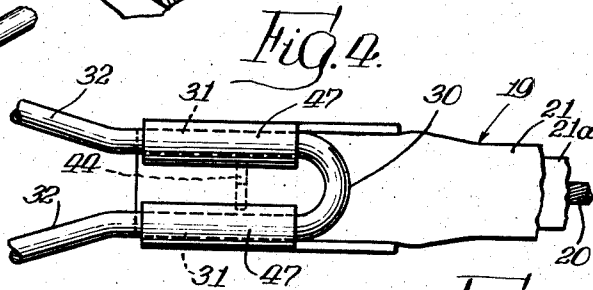
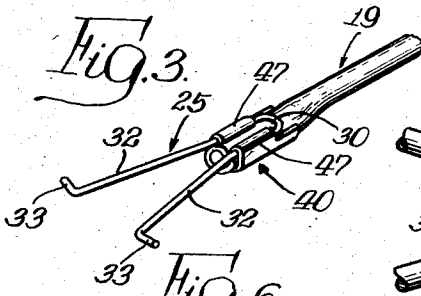
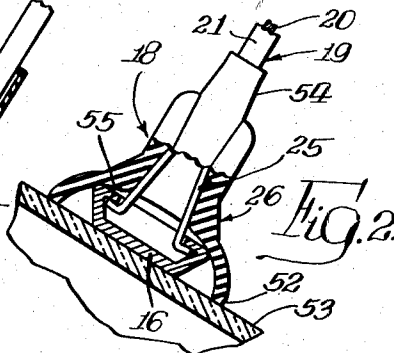
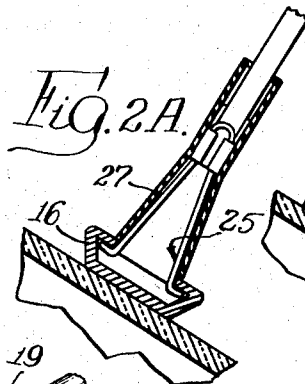
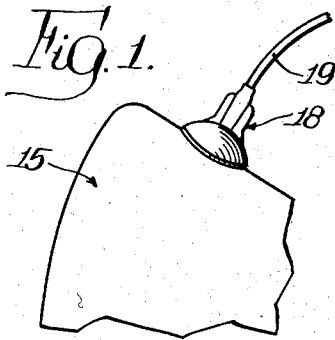
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ANODE CONNECTOR

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2,869,100

ANODE CONNECTOR

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3 Claims. (Cl. 339—97)

This invention relates generally to electrode connectors for cathode ray tubes and more particularly to improved means for joining such connectors to flexible supply conductors associated therewith.

With the advent of television, cathode ray tubes have experienced widespread use in television receivers. It is normal practice in such receivers to have the anode of the tube supplied with high electrical potential means of a short length of well insulated flexible conductor which extends from a source of high voltage potential to a socket means or terminal secured to and forming a part of the cathode ray tube. The free end of this conductor is normally supplied with a terminal clip insertable in the socket means on the tube.

Various schemes have been presented for connecting the flexible conductor to the clip in the above related circumstance, and while such previous connector clips and their connection with the flexible conductor have proven satisfactory, presently known assemblies of this type are in need of improvement.

The present invention seeks to present a new and improved means for joining a terminal clip to a flexible supply conductor and to present, in conjunction therewith, an improved terminal clip and insulator shield means to the end that a more secure and efficient connection between the supply conductor and the anode terminal of the cathode ray tube is brought about. Previous means of connecting such clips to the flexible conductors have generally required soldered connection between the clip and the conductor. Such soldered connection is positive, but requires exposing a portion of the conductor wire to effect the soldered connection. The presence of such a bare conductor wire in a high voltage connection of this class is desirably avoided, if possible, to prevent arcing, corona and short circuit hazard. Since occasion requires the removal of the clip from the anode terminal, it is also essential and desirable to avoid imposing strain or force on the connection between the clip and conductor. Thus, if one pulls on the conductor to remove the terminal clip, it is desirable that such pulling force be taken by the conductor or clip, rather than by the means joining these two members together. Certain presently known connectors have provided means for avoiding strain on the connection between the terminal clip and the conductor, but such means have entailed expensive and time consuming structure from the manufacturer's viewpoint to the end that their production is costly or cumbersome and, therefore, requisite of improvement.

Briefly, the present invention seeks to provide a new and improved connector assembly for use with the anode terminal of a cathode ray tube including improved fastening means for making positive physical and electrical junction between the terminal clip and a flexible supply conductor. My new fastening means also successfully avoids the need for exposing the conductor wire of the flexible conductor in effecting such positive electrical connection. Since there is no exposed conductor wire

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at its connection with the flexible conductor, the assembly of the present invention is improved from a safety standpoint over previous devices of this class.

The connector clip of this invention comprises a pair of divergent flexible leg elements engageable with the terminal socket of the cathode ray tube. Such leg elements are compressed by my new fastening means into the outside insulation of the flexible supply conductor in such a manner that any pulling force exerted on the conductor is transmitted directly to the terminal clip via the external insulation of the conductor, rather than to its point of electrical connection with the clip member. The fastening means of the present invention also includes a prong system for electrically joining the terminal clip to the concealed wire core of the flexible supply conductor. By this expedient it is not necessary, as is in previous connector assemblies of this class, to have exposed electrical wires available for soldered connection with the terminal clip.

The main object of the present invention is to provide a new and improved connector assembly, especially adapted for connection with the anode socket of a cathode ray tube and the like.

Another object of this invention is to provide a new and improved anode connector assembly, as aforesaid, in which means are provided for insuring positive electrical connection between a flexible conductor and a terminal clip while maintaining the electrical wire of the conductor in a concealed condition within surrounding insulation of the conductor.

A still further object of this invention is to provide a new and improved anode connector for use with a cathode ray tube in which a new and improved means is employed for physically connecting the conductor to the anode connector.

Still another object of this invention is to provide an improved anode connector in which means are provided for effecting electrical circuit connection between a flexible metal clip member and the wire core of an insulated conductor by penetrating the insulation of such conductor.

Still another object of this invention is to provide a new and improved anode connector assembly which embodies means for its connection with a supply conductor in such a manner that the electrical conductor wire or core thereof is maintained within an insulated barrier to insure against corona effect and short circuit hazard.

An additional object of this invention is to provide an electrode connector device including a flexible terminal clip, means for securing the clip to an electrical conductor, and a means for shielding the exposed portions of the terminal clip and its junctions with a supply conductor and the electrode terminal of a cathode ray tube from dust and other foreign materials.

A still further object of this invention is to provide a new and improved anode connector, as aforesaid, including means to avoid strain and pulling force at the point of electrical junction between a resilient terminal clip and an electrical conductor associated therewith.

The above and further objects, features and advantages of the new and improved connector of this invention will be recognized by those familiar with the art from the following detailed description and specifications therefor and will be readily more understandable in light of the embodiments illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a partial side elevation of view illustrating a cathode ray tube and the use of my improved connector means therewith;

Figure 2 is a broken away cross-sectional view, enlarged over the scale of Figure 1, showing the arrangement used for joining the connector assembly of this

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invention to the anode terminal of the cathode ray tube shown in Figure 1;

Figure 2A is a cross-sectional view, similar to Figure 2, illustrating a modified connector assembly embodying the features of this invention;

Figure 3 is a perspective showing of a preferred form of terminal clip used in this invention and means for associating such with a flexible supply conductor;

Figure 4 is an enlarged top-plan view of the connector means set forth in Figure 3;

Figure 5 is a side elevational view of the same;

Figure 6 is a cross-sectional view taken substantially along the line 6—6 of Figure 5;

Figure 7 is a bottom-plan view of the assembly illustrated in Figures 3, 4 and 5;

Figure 8 is a plan view of a forming blank for the fastening means employed with the improved terminal clip of Figure 3;

Figure 9 is a partial enlarged bottom-plan view, similar to Figure 7, illustrating a modified form of fastening means for the improved anode connector assembly of this invention;

Figure 10 is a cross-sectional view taken substantially at line 10—10 of Figure 9; and

Figure 11 is a plan showing a forming blank for the modified fastening means employed in the connector assembly of Figure 9.

Turning now to the drawings and particularly to Figures 1 and 2 therein, a cathode ray tube 15 has an anode connector terminal 16 which is connected to a high voltage power supply (not shown) by means of the improved connector assembly 18 of this invention and a short length of flexible electrical conductor 19. The conductor 19 has a central electrically conductive core 20 which may comprise either single or multiple strands of wire. Insulating material surround core 20 and may comprise, as shown, multiple layers 21 and 21a. The number of insulation layers, their thickness and composition is dependent on the voltage requirements to be met in various installations, and thus may vary widely.

The connector assembly 18 of this invention includes a terminal clip, indicated generally by numeral 25 in Figure 2, which may be surrounded by a suitable dust shield means, such as the molded rubber dust cap 26 of Figure 2, or a tubular sleeve 27 of insulating material, as seen in Figure 2A, designed to resist flame and corona effect. If desired, both the cap 26 and the sleeve 27 may be eliminated from the assembly, although their use is recommended for improved safety of operation.

Clip 25, as best seen in Figure 3 of the drawings, comprises a length of solid metal wire having a rather stiff and resilient physical makeup, as for example music wire. The wire of clip 25 is formed with a mid-portion bent as a reentrant loop and designated generally by numeral 30. The loop 30 is open at one end with free end portions of the wire extending outwardly from the curvilinear loop being formed to present a pair of straight arm portions 31—31 (best viewed in Figure 4). Such arm portions 31—31 are arranged in parallel spaced relation and joined integrally with divergently related and outwardly extending leg portions 32—32. These leg portions are preferably directed to form a divergent fork extension lying in a plane common with loop portion 30 and arm portions 31—31. The free ends of leg portions 32—32 are bent outwardly in opposite directions to form lock finger portions 33—33.

To fasten the clip 25 to the flexible conductor 19, I provide a resilient metal fastener indicated generally by numeral 40 in Figure 3. The metal fastener 40 is formed of brass or similar material having desired strength and flexibility for bending purposes. A forming blank 40a for fastener 40 is shown in Figure 8 of the drawing as comprising a first rectangular section 41 and a second rectangular section 43 disposed centrally along

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one side 42 of section 41. A single prong 44 of triangular shape is upset or punched out of the rectangular section 41 substantially on the lateral center line thereof and according to the outline of triangular opening 44a shown in Figure 8, so as to extend substantially 90° from the plane of the forming blank. Prong 44 is cut from the metal of the blank 40a along two sides only with the third side or base of its triangular configuration remaining integral with the rectangular section 41.

To join the clip 25 to conductor 19, the fastener blank 40 is placed beneath the conductor 19 at one end thereof. The prong 44 is then insertably thrust through the insulation layers 21 and 21a of the conductor to make penetrating contact with the wire core or metal conducting portion 20 of the flexible conductor 19 (see Figure 6). In regard to the penetration of the prong member 44 through the exterior insulation of the conductor 19, it will be observed that the extreme tip or apex end of the prong preferably penetrates the core 20 to insure positive and good electrical contact therewith. To this end, core 20 is best formed of plural wire strands suitably woven or twisted according to accepted wire making practice. Once the prong 44 is so inserted into the conductor core 20, the remaining portions of the blank 40a, and in particular its rectangular sections 41 and 43, are bent upwardly along opposite sides of the conductor 19 to form spaced side walls 45 and 46, as best viewed in Figure 6. The clip 25 is then placed along the upper side of conductor 19 and the outer ends of walls 45 and 46 suitably rolled over and bent reentrantly downward about the parallel arm portions 31 of the terminal clip 25, compressing the exterior insulation 21 of the conductor 19. This operation forms hooks 47—47 which sternly embrace the arm portions 31 of the clip 25 and press the same into the insulation 21. It will be noted that the lateral dimension for the rectangular portion 41 of the connector blanks is substantially equivalent to the length of the arm portions 31 of the connector clip, so that when the ends of such rectangular portion are rolled over to form the hooks 47, they substantially cover the exterior surfaces of the arm portions 31. The second rectangular section 43 of the connector blank 40a, being shorter than section 41, provides clearance for the loop or eye 30 of the terminal clip, as will be appreciated by examining Figure 5 of the drawings. Note also that the wrapping operation for applying the fastener means 40 is such as to securely compress the insulation of the flexible conductor 19 thereby to provide positive physical connection between the fastener means 40 and such conductor 19. Particularly, this feature provides a tight grip of the insulation on the conductor 19.

An important feature of my new anode connector is found in the fact that electrical and physical connection between the terminal clip 25 and conductor 19 is accomplished without exposing of any portion of the conductor wire core 20. Rather, electrical connection between the clip 25 and conductor 19 is performed solely by the inserted activity of the prong element 44 and its penetration through the insulation of the conductor 19. To further guarantee against exposing the wire core 20, the outer end 50 of the conductor 19 is preferably sealed over by molten or liquid plastic, or other suitable material designed to resist corona effect. Such material may be applied conveniently as by dipping or painting procedures.

The tight grip afforded by the compression of the insulation layers 21 and 21a in mounting the connector means 40 thereabout serves to provide a strong connection between the conductor and connector clip which is positive in its activity to effectively oppose separation of electrical connection between the clip 25 and wire core 20 of conductor 19, as might occur by pulling on the conductor 19 in withdrawing the clip from the anode socket of the cathode ray tube.

It will be understood, therefore, that the compressed grip of the fastener means 40 with the exterior of conductor 19, and in particular its compression of the insulation of such conductor 19, effectively transmits all pulling force between the clip and the exterior insulation of the conductor 19.

After assembly of the clip 25 and conductor 19 by means of the resilient fastener means 40, as described, the dust cap 26 may be placed around the shank end of the clip means 25 with the conductor 19 passing through a suitable coaxial opening of such dust cap, substantially as illustrated in Figure 2. In making connection with the anode socket 16 of the cathode ray tube, the two leg portions 32—32 of the clip element are squeezed together between the thumb and forefinger of the user and inserted within the socket presented by the anode terminal 16. This latter action requires compressive engagement between a flexible annular lip portion 52 of the dust cap and the exterior surface 53 of the cathode ray tube to provide an effective dust seal. It will also be recognized that the outer end of dust cap 26, as indicated by numeral 54, tightly grips the exterior insulation of the conductor 19 to prevent the entrance of dust thereabout. The dust cap is preferably formed of a resilient material, such as rubber, so that the leg portions 32—32 of the clip 25 may be moved toward each other when inserting such into socket 16 by merely squeezing the exterior of the dust cap appropriately between thumb and forefinger. When the squeezing pressure on the two-leg portion 32 is released, the fingers 33 at the outer ends thereof snap into place behind an annular flange 55 at the mouth of the anode terminal socket 16. The compression of the lip 52 of the dust cap thereafter serves to provide a reverse pulling thrust on the clip 25 to maintain the finger portions 33 tightly against the flange 55 for good electrical contact. In other installations, the dust cap 26 is not desired and the corona shield provided by the tubular sleeve 27 of Figure 2A is employed in its stead. Such sleeve 27 is installed by simply threading conductor 19 therethrough and stretching the same over the spread leg portions 32—32 of the terminal clip. In certain other installations neither the cap 26 nor the sleeve 27 are necessary, in which event the bare assembly as pictured in Figure 3 is connected directly to anode terminal 16 of the cathode ray tube.

In addition to the connector assembly 18 as hereinabove described, I have also devised a second form of connector assembly 18' as shown in Figures 9 through 11. The second or modified connector means 18', therein shown, differs in the main from the connector assembly 18 in that its fastener means 60 provides two contact making prong members 61—62 for establishing electrical circuit between the single wire conductor or element 20 and the clip 25'.

The fastener means 60, as best seen from the forming blank 60a therefore (see Figure 11), comprises a substantially rectangular plate of brass or similar electrical conductive material having plural triangular openings 61a and 62a along its lateral center line to form two or more prong members 61—62. Note that prong 62 has its apex directed oppositely from that of prong 61. Therefore, while the single prong 44 of the fastening means 40, hereinabove described, is disposed so that its apex lies substantially on the lateral center line of the blank 40a, the plural prong members of fastener means 60 are disposed in a direction turned 90° from the disposition of prong means 44. In other words, while prong member 44 has its plane substantially transverse to the longitudinal axis of conductor 19, the prong means 61 and 62, shown in Figure 9, have their planes of formation lying substantially coplanar with such axis of conductor 19.

As before, a terminal clip 25' having parallel arm portions 31'—31' and diverging leg portions 32'—32' is employed with the fastener means 60 in the modified

assembly of Figures 9 and 10. This modified clip means 25' has a central reentrantly bent loop portion 30' corresponding to loop portion 30 of the connector clip 25 previously described. It will be noticed that the arm portions 31'—31' are somewhat longer than the arm portions 31 of clip 25, so that the cut-away configuration as provided by the secondary foreshortened portion 43 of connector blank 40a is not required in fastener means 60, thus accounting for the rectangular formation of blank 60a, illustrated in Figure 11. In assembly, the rectangular blank 60a is turned upwardly to form walls 65 and 66, and thence downwardly around the arm portions 31' and 31' in the manner of fastening clip 25 of Figure 3, as previously described. If desired, a dust cap or sleeve may be used to cover the exterior of fastener means 60 and the shank portion of the flexible conductor 19.

This modified form of the connector assembly 18' provides added insurance for positive electrical connection between the connector and the wire 20 of the flexible cable 19 and furnishes additional gripping action to the exterior of such conductor due to the increased gripping area provided by the rectangular fastener blank 60a. In this latter respect, it will also be regarded that the length of the arm portions 31' engaged by reentrantly turned or compressed outer edges 67 of the fastener means 60 is increased over the corresponding connection area between fastener 40 and clip 25 first described. Thus, added physical engagement between the elements is afforded in the modified assembly of Figures 9, 10 and 11.

From the foregoing, it is believed that those familiar with the art will recognize the present invention provides an improved advancement over previous devices of this character, and that while I have herein described and shown the features of my invention in conjunction with a preferred and modified form thereof, nevertheless, various changes, modifications and substitution of equivalents may be made therein without necessarily departing from the spirit and scope of its inventive aspects. As a consequence, it is not my intention to be limited to the particular form of anode connector herein shown and described except as may appear in the following appended claims.

I claim:

1. In a connector for electrically connecting an insulated flexible conductor with an electrode socket of a cathode ray tube, the combination of a clip member of resilient spring wire having a return bend at one end and divergent leg portions at the other end thereof, said clip member lying at one side of and at one end of said flexible conductor with the divergent leg portions of said clip projecting beyond said one end of said conductor, a fastener substantially encircling said conductor between said one end of the latter and said return bend of said clip, said fastener having opposed edge portions extending lengthwise at said one side of said flexible conductor at said one end thereof, said edge portions having the lengthwise edges thereof extending inwardly of said flexible conductor and displacing the insulation of the same for securing the portions of said clip between said return bend and said divergent leg portions between said edge portions of said fastener and said flexible conductor.

2. In a connector for electrically connecting an insulated flexible conductor with an electrode socket of a cathode ray tube, the combination of a clip member of resilient spring wire having a return bend at one end, divergent leg portions at the other end, and parallel arm portions intermediate said return bend and said divergent leg portions, said clip member lying at one side of and at one end of said flexible electrical conductor with the divergent leg portions of said clip projecting beyond said one end of said flexible conductor, a fastener substantially encircling said flexible conductor about said parallel arm portions between said one end of said

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conductor and said return bend of the clip, said fastener having opposed edge portions extending lengthwise at said one end of said flexible conductor at said arm portions of said clip, and said edge portions having the lengthwise edges thereof extending inwardly toward said flexible conductor and displacing the insulation of the same, whereby the arm portions of said clip are encased between said edge portions of said fastener and said displaced insulation of said flexible conductor.

3. In a connector for electrically connecting an insulated flexible conductor with an electrode socket of a cathode ray tube, the combination of a clip member of resilient spring wire having a return bend at one end, divergent leg portions at the other end, and parallel arm portions intermediate said return bend and said divergent leg portions, said clip member lying at one side of and at one end of said flexible electrical conductor with the divergent leg portions of said clip projecting beyond said one end of said flexible conductor, a fastener substantially encircling said flexible conductor about said parallel arm portions between said one

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end of said conductor and said return bend of the clip, said fastener having opposed edge portions extending lengthwise at said one end of said flexible conductor at said arm portions of said clip, said edge portions having the lengthwise edges thereof extending inwardly toward said flexible conductor and displacing the insulation of the same, whereby the arm portions of said clip are encased between said edge portions of said fastener and said displaced insulation of said flexible conductor, and said fastener having prong means penetrating the insulation of said flexible conductor.

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