

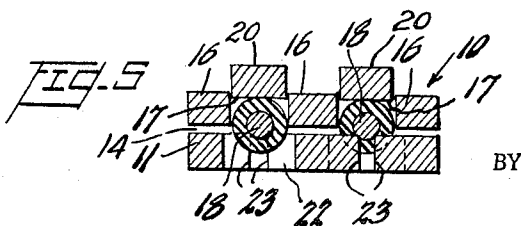
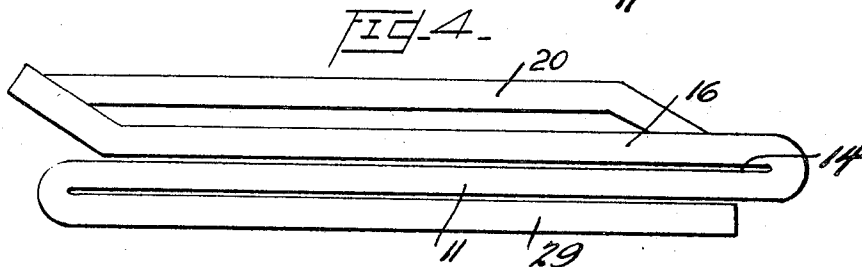
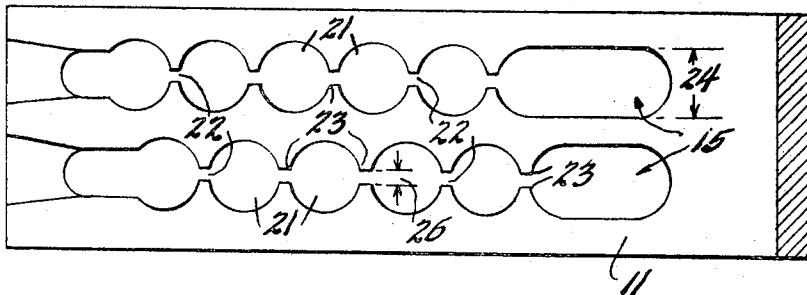
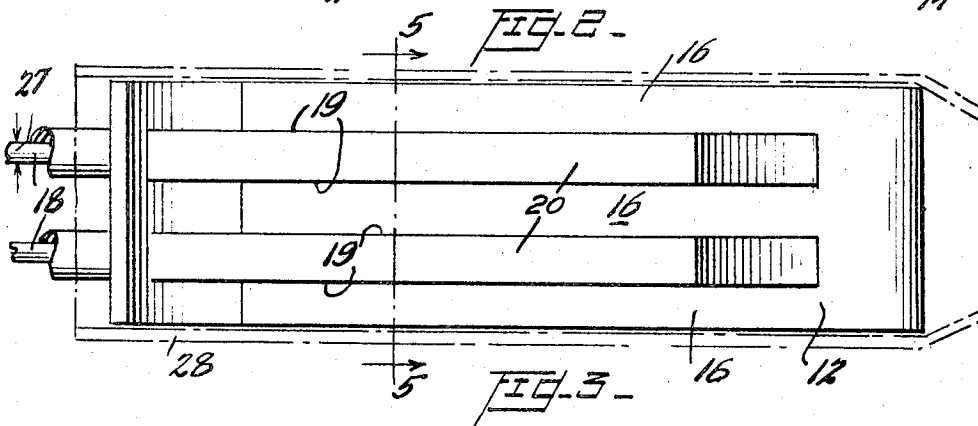
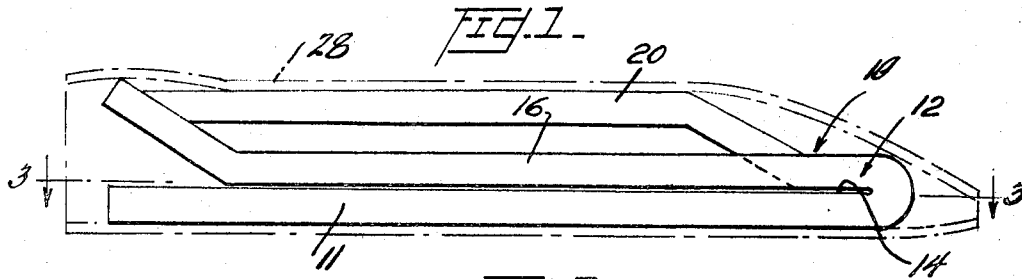
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QUICK CONNECT SOLDERLESS WIRE CONNECTOR

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QUICK CONNECT SOLDERLESS WIRE CONNECTOR

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ABSTRACT OF THE DISCLOSURE

A connector retains two insulated wires in slots formed in a strip of resilient, electrically conductive metal. Each slot constitutes a series of holes, interconnected by slits to define teeth. The strip has a U-shaped configuration with the toothed slots opposed by aligned grooves in a pressure arm. The grooves initially receive the insulated wires, whereupon pressure on the pressure arm forces the wires into the toothed slots. The teeth bite through the insulation to electrically contact the wires and mechanically retain them in place. An electrical insulator covers the connector.

This invention relates to a quick connect solderless wire connector and more particularly, it relates to a solderless one-piece wire connector in which a pair of wires may be inserted and electrically connected by merely depressing one section of the connector.

Wire connectors must provide a low-resistance, low-noise, metal to metal contact at the time the connection is made and maintain these desired characteristics for the duration of the life of the connection under severe environmental stresses. Wire connectors of the prior art include soldered binding posts, solderless wrap devices and crimpable insulation piercing terminals. These connectors, while making satisfactory connections, suffer from commercial disadvantages due to manufacturing and other costs associated with perfecting such connections. Further, the use of many of these prior art connectors require associated equipment such as soldering irons, wire wrapping guns or elaborate crimping tools.

Therefore, it is an object of this invention to provide a novel, quick connect, solderless wire connector.

It is a further object of this invention to provide such a novel connector in which wire is transversely forced into toothed slots without the use of special auxiliary tools.

It is also an object of this invention to provide such a novel connector in which the widths of the slots are greater than the diameter of the wires, and the distances between opposed teeth are less than the diameter of the wire.

With these and other objects in view, the present invention contemplates an electrical connector bent from one strip of conductive, deformable metal to provide a pair of spaced, overlying arms spanning a bight between which are placed a pair of wires that are forced, by squeezing together the arms, to move the wires into toothed slots formed on one of the arms.

The widths of the slots are greater than the diameter of the wires, and the distances between the opposed teeth are less than the diameter of the wires so that wire forced and moved into the slots result in the teeth biting into the wire to make a positive metal to metal electrical contact. In making connections to insulated wire, the teeth will cut through the insulation and bite into the wire.

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To insulate the connector, the metal strip can either be coated with an insulating material or the entire connector can be surrounded with a heat shrinkable insulating sleeve, or a pre-assembled elastic insulating sleeve.

In another embodiment the other arm has a set of three ribs formed on and longitudinally extending along the arm and into the bight to provide a pair of grooves for receiving and guiding the pair of wires into registration with the slots.

In a further embodiment a third arm can be formed from the metal strip, by bending it back upon the arm having the toothed slots, in order to further protect the completed connection.

Other objects and advantages of the invention will become apparent by reference to the following detailed specification and accompanying drawings, wherein:

FIG. 1 is a side elevational view of a quick connect solderless connector embodying the principles of the invention;

FIG. 2 is a top view of the connector shown in FIG. 1, illustrating the seating of a pair of wires in a pair of toothed slots;

FIG. 3 is a sectional view of FIG. 1 taken along line 3-3, depicting the shape of the toothed slots;

FIG. 4 is a front view of another connector embracing an alternate embodiment of the invention;

FIG. 5 is a sectional view of FIG. 2 taken along line 5-5, illustrating an overlying relationship between a pair of arms having toothed slots in one arm and grooves on the other arm.

Referring now to FIG. 1 of the drawing, there is shown a U-shaped quick connect solderless wire connector 10, consisting of a toothed arm 11 and a pressure arm 12 bent from one strip of resilient or deformable electrically conductive metal to span a bight 14.

Pressure arm 12 has a set of three ribs or ridges 16 formed on and longitudinally extending along the arm 12 and into the bight 14, thereby providing a pair of grooves 17 for receiving wires 18. As best seen in FIGS. 2 and 5, the ribs 16 and the grooves 17 are made by forming four cuts 19 dividing the arm 12 into five sectors. The two sectors 20 which are adjacent to the center sector are bent upward to form the grooves 17. The remaining three sectors are the ribs 16. The ribs 16 and the grooves 17 may also be formed by a pressure shaping operation without previous slitting.

The toothed arm 11, as best seen in FIG. 3, has two toothed slots 15 thereon to grip wires 18 which may be insulated or bare. The shape of the slots 15 is defined by a series of holes 21 interconnected by a series of slits 22, thereby providing teeth 23 for biting through the insulation and into wires 18. The slots 15 have a predetermined width 24 sufficient to receive a pair of wires 18 while a predetermined distance 26, less than the diameter of the wires 18 between opposed teeth 15, enables these teeth 23 to bite into the wires 18. The holes 21 of one slot 15 are formed opposite the slits 22 of the other slot 15 so that a strong connector 10 is made from a minimum of material.

The toothed slots 15 may be formed by punching in a punch press. In this way, the novel connectors 10 can be mass produced at a very low cost. However, the slots 15 may be made by other known methods such as drilling the holes 21 and then cutting the slits 22.

As best illustrated in FIG. 5, the grooves 17 lie adjacent to the slots 15 so that wires 18 of a predetermined

diameter 27 (FIG. 2) received in the grooves 17 are forced transversely into the slots 15 when the pressure arm 12 is flexed with or without the aid of a conventional pliers. Opposed teeth 23 which are spaced apart a distance 26, less than the diameter 27 of a wire 18, bite through the insulation and/or surface films, if any, of the wire 18, and hold the wire securely. The wires 18 lie within the slots 15 since the thickness of arm 11 is greater than the diameter 27 of the wires 18.

In this embodiment, the strip may be coated with an insulating material such as an epoxy compound. This type of coating has properties which do not crack when the connector 10 is flexed to make the electrical connection. During the forming operation the insulating coating will be removed from the area immediately surrounding the toothed slot 15, thus exposing the metal of the arm 11 so that the teeth bite into the wires to establish a good electrical connection. In the embodiment of the invention illustrated in FIG. 1, the connector is constructed without an insulating coating and subsequently insulated by a heat shrinkable plastic sleeve. In this instance, two wires 18 are inserted and seated, then a heat shrinkable plastic sleeve 28 is placed over the connector 10. The sleeve 28 is heated and shrunk to insulate the connector. Instead of a heated shrinkable sleeve, an elastic sleeve may be assembled over the connector in which case the elastic sleeve would have a cross-sectional area slightly less than the cross-sectional area of the connector.

In a further embodiment shown in FIG. 4, a third or bottom arm 29, formed from the same strip is bent under toothed arm 11, to fully enclose and protect the wires 18 in the slots 15. The third arm 29 also serves to mechanically lock the wires in the slots. In this embodiment, the entire connector may be coated with an insulating material or the connector may be uncoated and a heat shrinkable or elastic sleeve fitted over the connector.

It is to be understood that the above-identified embodiments are simply illustrative of the principles of the invention, and numerous other modifications may be devised without departing from the spirit and scope of the invention.

What is claimed is:

1. In an electrical connector, a deformable U-shaped member, having a first arm and a second arm interconnected by a bent portion, made from one piece of conducting material, said first arm having a first toothed slot extending longitudinally therealong perpendicular to said bent portion for receiving a first wire and a second toothed slot also extending therealong for receiving a second wire, said toothed slots each having teeth on opposite longitudinal sides thereof extending toward opposing teeth, said second arm having sections overlying said toothed slots in said first arm arranged so that wires placed between said first and second arms adjacent and extending along said first and second slots will be transversely forced between the teeth of said slots by flexure of said U-shaped member, thereby forming a durable ohmic connection between said wires.
2. In an electrical connector, a strip of electrically conductive metal bent to provide a pair of spaced overlying arms spanning a bight, a set of three ribs formed on and longitudinally extending along one of said arms and laterally into said bight to provide a pair of longitudinally extending grooves for receiving a pair of wires, other of said arms having a pair of slots positioned in register with said grooves for receiving said wires upon flexure of said one arm, and teeth projecting into said slots and positioned to bite into said wires and retain said wires in said slots.
3. In an electrical connector as set forth in claim 2, a heat shrinkable insulating sleeve surrounding said bent strip to electrically insulate said strip.

4. In an electrical connector as set forth in claim 2, said bent strip of electrically conductive metal is coated with an insulating material.
5. In an electrical connector as set forth in claim 2, a third arm, formed with said strip of electrically conductive metal, bent back upon said other arm to confine said wires.
6. In an electrical connector as set forth in claim 2, an elastic insulating sleeve surrounding said bent strip to electrically insulate said strip.
7. In an electrical connector for connecting two wires having a predetermined diameter, a strip of electrically conductive resilient metal bent to provide a pair of spaced overlying arms spanning a bight, a set of three ribs formed on and longitudinally extending along one of said arms and laterally into said bight to provide a pair of grooves for receiving a pair of wires, said other of said arms having a pair of slots each having predetermined widths, said slots positioned in register with said groove for receiving said wires upon flexure of said one arm, said predetermined widths being greater than the diameter of said wire, and oppositely disposed first and second teeth projecting into said slots, the distance between said first teeth and said second teeth being less than the diameter of said wire to bite into said wire received therein and retain said wire in place.
8. In an electrical connector as defined in claim 7, wherein the wires are of a first predetermined diameter and are covered with an insulation of a second predetermined diameter, and the predetermined widths of the slots are greater than the predetermined diameters of the insulation.
9. In an electrical connector for a wire of predetermined thickness, a strip of material having an elongated slot passing laterally therethrough and wherein said slot is wider than the thickness of said wire, said slot formed by a plurality of linearly arrayed, circular holes, each hole passing laterally through said strip of material and each hole being interconnected with an adjacent hole by a slit extending along the line of said holes and passing laterally through said strip of material, each slit being narrower than the diameter of said holes to define teeth projecting in the plane of said strip from opposite directions into said slot distances sufficient to provide gaps therebetween which are less than the thickness of said wire so that said teeth bite into said wire upon subsequent forcing of said wire laterally into said slot.
10. In an electrical connector as defined in claim 9, a second elongated slot passing laterally through said strip of material parallel to said elongated slot and also defined by holes interconnected by slits to provide teeth for biting into a second wire forced laterally therebetween, and the holes of one of said slots positioned substantially in alignment with the slits of the other of said slots perpendicularly to said slots in the plane of said strip.
11. In an electrical connector: a flexible strip of electrically conductive metal bent to provide a pair of spaced overlying arms spanning a bight; a set of two ribs formed on and longitudinally extending along one of said arms and laterally into said bight to provide therebetween a longitudinally extending groove for receiving a wire; the other of said arms having a slot positioned in register with said groove for receiving said wire upon flexure of said one arm; and

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teeth projecting into said slot and positioned to bite
into said wire and retain said wire in said slot.

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U.S. DEPARTMENT OF COMMERCE

PATENT OFFICE

Washington, D.C. 20231

**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

Patent No. 3,405,385

October 8, 1968

Willard E. Rapp

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 68, before "other" insert -- the --.

Signed and sealed this 17th day of February 1970.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents

