This invention relates to male plug electrical connectors of the externally threaded type and is concerned particularly with the use of skeleton type contacts in such a connector. The term "skeleton contact" is used herein to denote that type of contact which is nominally of cylindrical form but wherein only a portion in the form of a segment of the cylinder, forms the conducting member. It has been found that sufficient electrical contact area is provided when the proper portions of the defining cylinder are used. There is disclosed herein a male type electrical connector having a body adapted to receive a skeleton contact and a skeleton contact which may be formed from a single piece of contact material with great economy of material. Skeleton contacts have been known but there has been considerable wastage of material in their production and no particular simplification of the method of assembly of such contacts into prior known connector bodies. Further, there are shown, in the prior art, skeleton contacts for use with male type electrical connectors whose configuration has limited their use to very specific types of connectors. That is, such skeleton contacts have been suitable for use either with a male type screwed electrical connector for power-take-off from a female screwed receptacle or for use with fuse plugs. Similarly, skeleton contacts have been used within female sockets for receiving incandescent electric lamps. Again, skeleton contacts have also been used in the past where the cylindrical contact has been segmented purely to provide resilience, to the individual segments, in order to provide proper electrical connection between the male and female parts of such a junction when either one or both have been manufactured with relatively low manufacturing tolerances.

Accordingly, it is an object of this invention to provide a male plug electrical connector having a body which is so formed as to receive a one-piece skeleton contact which has a novel configuration which enables it to be formed from a single sheet of contact material with a minimum of wastage and which may be assembled into the plug body in a single operation and without the use of any auxiliary fastening means.

Accordingly, the invention provides a male plug electrical connector for use with skeleton contacts, said connector having a body comprising: a first hollow portion having a cylindrical outer surface portion and closed at one end thereof, a second hollow portion having a cylindrical outer surface, integrally formed with and coaxial to said second cylindrical portion and being of greater external diameter than first cylindrical portion, whereby defining a cylindrical step, and having at least one radially disposed aperture, adjacent said step and extending from the cylindrical outer surface of the said first portion to the interior of the body.

The invention further provides a one-piece blank for forming a skeleton contact for use with the abovementioned connector body, said blank being cut and scored to provide a plurality of integrally connected conductive panels, a selected pair which are adapted to be articulated so as to extend substantially normal, in one direction, to the plane of said blank and in a pair of parallel planes, and a further pair of said panels being articulated so as to extend substantially normal, in a direction away from said selected pair of panels, to the plane of said blank, and in substantially the same pair of parallel planes, each one of said further pair of panels cooperating with an associated one of said selected pair of panels to form a substantially coplanar T-shaped member.

The advantages of this invention will be appreciated when it is realized that the body per se may be molded from plastics or other electrical insulating material by commercially used high-speed molding techniques. The configuration of the body lends itself to simple molds and all the features required in the body of the connector may be incorporated during the molding process, no subsequent machining being required. Also, the configuration of the contact is such that it may take the form of a one-piece blank which may either be produced in a single stamping operation, resulting in a flat formation containing a plurality of lines of severance, or the final contact may be formed in a single operation wherein the required lines of severance, in a one-piece blank, are provided at the same time as the contact is bent along its appropriate score lines to form the final three-dimensional skeleton contact.

A preferred embodiment is illustrated in the accompanying drawings in which:

FIG. 1 is a pictorial view of the male electrical plug connector, without the skeleton contact in position;
FIG. 2 is an isometric view of the skeleton contact before introduction into the plug body;
FIG. 3 shows a one-piece blank prior to bending;
FIG. 4a is a section along the lines 4--4 of FIG. 1; and
FIG. 4b is a section similar to that of FIG. 4a but with the skeleton in position.

Referring now to FIG. 1, the body generally indicated at 1 includes a first hollow portion 2 which includes at least one segmental region 3 of radius slightly less than that of the outer radius of the said first hollow portion.

The hollow portion 2 is closed at one end by a boss or protuberance 4 which may or may not be of telescopic form. Concentrically disposed in relation to the boss 4 is an annular recess 4a (shown more clearly in FIGS. 4a and 4b), a radially disposed recess 4b, asymmetrically aligned with a segmental region 5 extends between the latter and the annular recess 4a, integrally formed with the first hollow portion 2, and coaxial therewith, is a second hollow portion of increased inside and outside diameters relative to the corresponding inside and outside diameters of portion 2. At the plane of juncture between the first portion 2 and the second portion 5, there is defined a step 6. At this step 6 there is formed a radially disposed aperture 7 which connects part of the outer surface of portion 2 and part of the outer surface of the portion 5 to their respective interior surfaces. With reference to FIG. 4a, it will be seen that the exterior surface of the segmental region 3 is radially spaced inwardly of the inside surface of the portion 5, by an amount which is substantially equal to the thickness of the contact material of the contact shown in FIG. 2, a third hollow portion 5a can be formed integrally with and extend co-axially from the second hollow portion 5.

Referring now to FIG. 2, there is shown the skeleton contact generally indicated at 10. The contact includes a pair of T-shaped side members 11 each having, in cross-section, the form of a segment of a hollow cylinder. The head of each T is integrally formed with bridge members 12 to be hereinafter described. The length of the upright of each T is adapted to be slidable received into the segmental region 3 in the body of the connector, as shown in FIG. 1. As shown in FIG. 2 the bridge members 12...
include downward directed joggles 12a which are necessary in order to take up an excess of metal when the contact is formed as will be hereinafter described. One or both of the aforementioned T-shaped side members 11 may include an inturnd flange 13 which may be used to make electrical connection to the skeleton contact. At the base of the upright of each T-shaped side member, is a hook-shaped extension 14 whose purpose will be described hereinafter. On the outer curved surface of the T-shaped members, there is included a thread formation 15, which, for convenience, may be stamped outwardly from the interior surface as shown.

FIG. 3 shows a one-piece blank for forming a skeleton contact. The blank may be made from any suitable electrical contact material. The blank includes a first pair of substantially parallel free marginal edges 16 and the second pair of substantially parallel free marginal edges, 17. Spaced inwardly and substantially parallel to each of the second edges 17 is a pair of common score lines 18, which extend between the two first edges 16. Spaced inwardly and substantially parallel to the first edges 16 is a pair of slits 19, which extend between the two common score lines 18. The common score lines 18 and the second edges 17 between them define a pair of secondary panels 20. At least one of the secondary panels 20 includes an auxiliary tab panel 23 defined by a pair of lines of severance 24 extending between the second edge 17 and the common score line 18.

Adjacent the second slit, the primary panels 22 include a pair of diametrically opposed cutouts 25. The cutouts 25 are defined by a first line of severance 26, intersecting and extending substantially perpendicularly away from the second slit and spaced from one of the said first slits 18 by a selected distance, and a second line of severance 27 intersecting and substantially perpendicular to the said first line of severance 26, a third line of severance 28 parallel and offset to said first line of severance 26, said third line of severance intersecting said second line of severance 27, a fourth line of severance 29 substantially parallel to said second slit, intersecting said third line of severance and one of said first slits, said fourth line of severance having a length greater than said selected distance, thereby defining a latch-shaped extension 14.

The one-piece blank may be formed with screw engaging means included in the primary panels 22, said screw engaging means having the form as shown in FIG. 2, and wherein the screw engaging means on one panel lies on a common helix with the screw engaging means on the other panel. Similarly, when the blank is formed with the various slits and lines of severance incorporated, the primary panels 22 may coincidentally be formed into arc-shaped configuration corresponding to the side members 11 shown in FIG. 2. Alternatively, the primary panels may be bent downwards along their associated common score lines 18 into a position substantially perpendicular to the bridge panels 21 and the necessary curvature impressed on the primary panels subsequently to bending along the score lines 18. The secondary panels 20 are each bent upwards into substantially parallel relationship with one another and again substantially perpendicular to the bridge panel 21. The auxiliary tab panel 23 is bent inwardly along the common score line 18 to form tab 13.

The common score lines 17 are spaced apart by an amount sufficient to provide the primary panels 22 and, subsequently, the side contacts 11, formed therefrom, with sufficient length. However, when the contact 10 is formed, it is necessary that the cylinder defining the contacts be of a diameter appropriate to the connector body 1. In order to provide for variations in the diameter of the defining cylinder, the bridge members 12 may be joggled as shown in FIG. 2 to set the diameter of the defining cylinder, to a required size, by taking up the surplus length, of the bridge panels 21, in the associated joggles.

FIG. 4 shows the contact in position in the connector body. The contact is introduced into the body as shown in FIG. 4b by passing the completed contact of FIG. 2 downwardly and through the arc-shaped apertures 7. When the female contact has been pressed as far as possible, the latch-shaped extensions 14 are bent inwardly into the annular recess 4c thereby to retain the contact against subsequent movement. FIG. 4b also shows a center contact 30 which may be used for forming the electrical connection of opposite polarity. In some embodiments, the contact 30 and the female contact 10 may be bridged, by a fusing element 13e, to form a conventional male threaded fuse member. Similarly, contact 30 and female contact 10 may be provided with cable attaching means whereby the assembly may be used as a screwed male power connecting device. In the case of the embodiment wherein the assembly is used for a fuse, the open end of the body may receive a transparent window (not shown) for viewing the fusing element.

It is possible to use only one side contact member 11 in which case the diametrically opposite side of the body will have no segmental region 3 but may include male thread engaging means integrally formed on the diametrically opposite outer surface of the hollow portion 2.

What is claimed is:

1. A one-piece skeleton contact comprising: two diametrically opposed T-shaped side members, each being an opposed segment of a common cylinder, each having a leg of said T substantially parallel to the axis of said cylinder thereby constituting a first portion and each having a capital of said T substantially perpendicularly to said leg, constituting a second portion, said first portion including an outward facing thread-engaging means on the exterior part-cylindrical surface thereof, the thread engaging means on one side member and the thread engaging means on the other said side members being disposed on a common helix, said second portion being integrally attached to the said first portion at a marginal end thereof, a pair of bridge members, disposed in chordal relationship to said T-shaped members and each having a pair of ends, respective ones of which being integrally attached, to the said side members, at the second portions thereof, said bridge members being laterally spaced apart by an amount substantially equal to the developed segmental dimension and each having a length at least equal to twice the cylindrical length of said first portion.

2. The contact of claim 1 wherein said thread engaging means includes at least one segment of a screw thread.

3. The contact of claim 1 including a latch-shaped extension to each of the side members, each said extension being substantially disposed in the same cylindrical surface as that of said side member, and having a first limb, substantially parallel to said side member and integrally attached to the free marginal end of said side member, remote from said capital, and a second limb substantially perpendicular to first limb and integrally attached to a marginal edge thereof, said second limb having a greater segmental length than that of said first limb.

4. The contact of claim 1 wherein said side members are substantially longer than twice the cylindrical length of said first portion and each having a joggle disposed substantially midway along the length of said bridge members, said joggle being formed on that side of the bridge members directed towards the legs of said T-shaped members.

5. The contact according to claim 1 including an inturnd tab formed in the capital of at least one said T-shaped member, and lying substantially in the plane.
of said bridge members, said tab being formed by bending inwards a short segmental length of said flange.

6. A one-piece blank for forming a skeleton contact, said blank having a first pair of substantially parallel opposed free marginal edges and a second pair of substantially parallel opposed free marginal edges, a pair of first slits disposed inwardly and substantially parallel to said first edges, and extending intermediate said second edges, and a second slit, substantially perpendicular to and intercepting each of said pair of first slits, a pair of common score lines, each of which joins a pair of adjacent ends of said pair of first slits, each score line intercepting each of said first edges, said pair of first slits, said second slit and said score lines cooperating to define a pair of primary panels, each adapted upon bending along its associated score line, into perpendicular relationship with said blank, to form a contact, said pair of score lines and said pair of second edges defining a pair of secondary panels, each adapted upon being bent along its associated score line, into perpendicular relationship with said blank to form, together, with its associated primary panel, a T-shaped member, each of said first slits and associated portions of the said first edges defining a bridge member, a pair of diametrically opposed cutouts in said primary panels, each of said cutouts being defined by a first line of severance, intercepting and extending substantially perpendicularly away from said second slit and spaced from one of said first slits by a selected distance, a second line of severance, intercepting and substantially perpendicular to said first line of severance, a third line of severance intercepting said second line of severance, a fourth line of severance, substantially parallel to said second slit, intercepting said third line of severance and one of said first slits, said fourth line of severance having a length greater than said selected distance, thereby to define a latch-shaped extension to each of said primary panels.

7. The one-piece blank of claim 6, including, on at least one secondary panel, a pair of lines of severance, substantially perpendicular to and extending between said second free marginal edge portions and said common score lines and adapted upon bending about the associated portion of the said common score line, to form an inward facing tab laying substantially in the plane of said bridge members.

8. A male plug connector body, for use with skeleton contacts, comprising a first hollow portion having a cylindrical outer surface portion and closed at one end thereof, said cylindrical outer surface including a segmental depression having a pair of substantially parallel sides, an annular recess in said closed end, a second hollow portion having a cylindrical outer surface integrally formed with and coaxial to said first cylindrical portion at the other end thereof and being of greater external diameter than said first cylindrical portion thereby defining a cylindrical step, at least one radially disposed aperture adjacent said step, extending from the cylindrical outer surface of said second portion to the interior of said body and a cylindrical external protuberance coaxially disposed and integrally attached to said closed end of said body, said annular recess being coaxially disposed to and adjacent said protuberance and said depression being longitudinally aligned with said aperture.

9. The connector body of claim 8 including a third hollow portion, having a cylindrically outer surface, integrally formed with and coaxially to said second portion, said third portion being of greater diameter than said second portion.

10. The connector body of claim 8 including at least one radially disposed slot connecting said annular recess and the outer cylindrical surface of said first portion.

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