

[54] ELECTRICAL TERMINAL HAVING FOLDED BLADE AND METHOD OF MANUFACTURING SAME

[75] Inventors: Charles Robert Curtis, "La Hacienda", Atizapan de Lopez Mateos, Mexico; John Theodore Lawrence, Harrisburg, Pa.

[73] Assignee: AMP Incorporated, Harrisburg, Pa.

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[56]

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Primary Examiner—Jordan Franklin

Assistant Examiner—William L. Falk

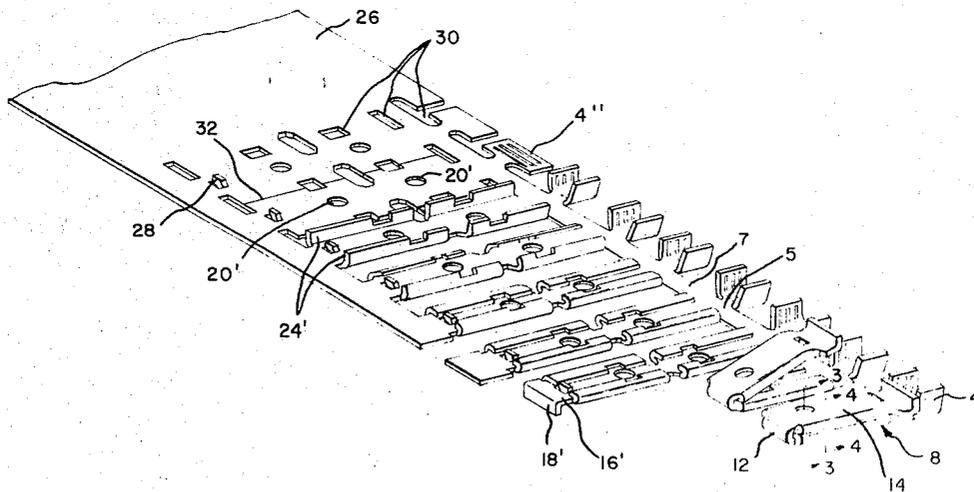
Attorney—William J. Keating et al.

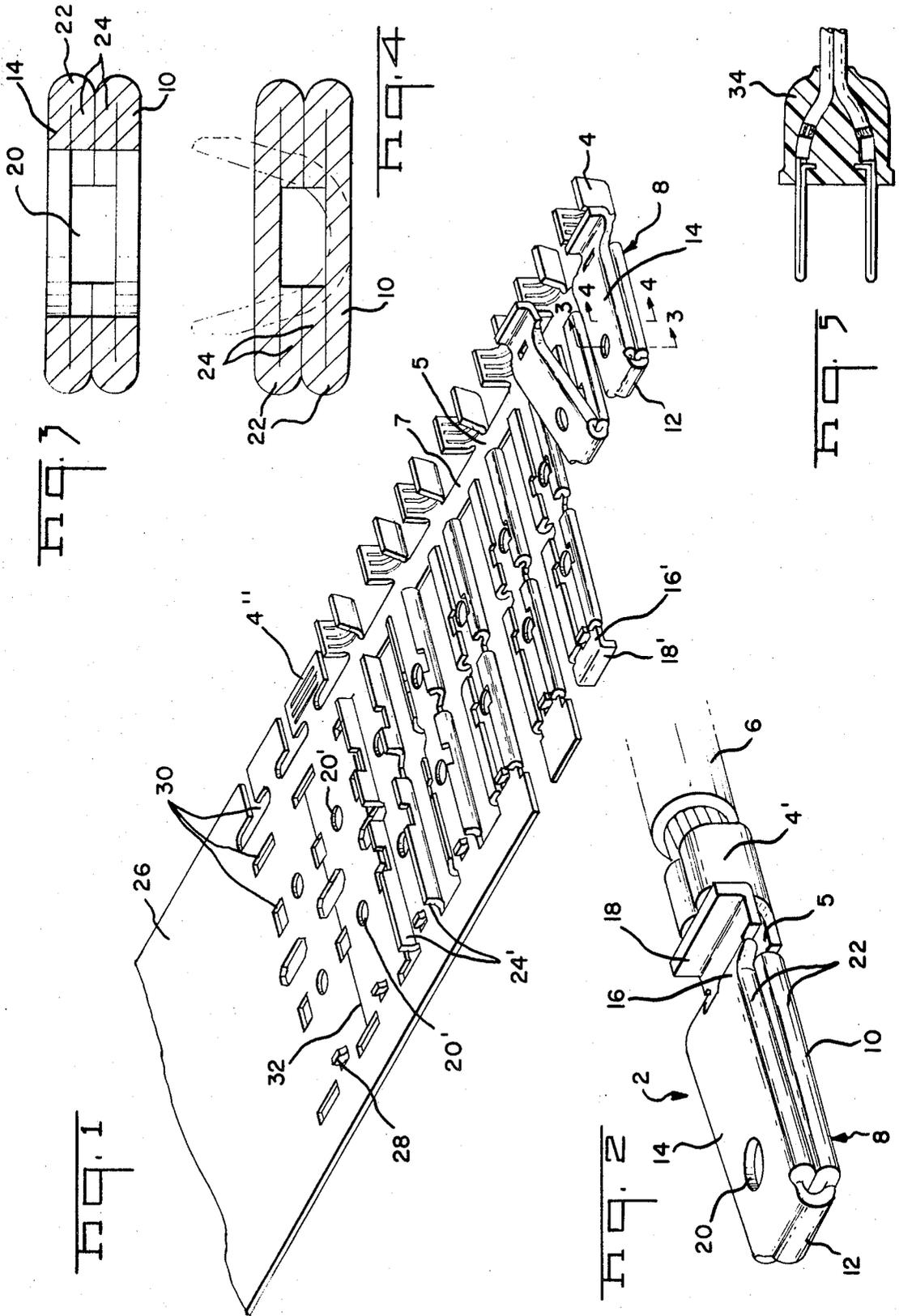
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ABSTRACT

Electrical contact terminal has a folded blade type contact portion, the marginal edges of each section of the blade being bent inwardly towards the center of the blade and tucked between the two sections of the blade to provide rigidity and strength for the full length of the blade.

3 Claims, 5 Drawing Figures





**ELECTRICAL TERMINAL HAVING FOLDED
BLADE AND METHOD OF MANUFACTURING
SAME**

BACKGROUND OF THE INVENTION

This invention relates to electrical contact terminals of the folded blade type which are used in large numbers on electrical cords for ordinary 110 V or 220 V service.

The standard electrical plug connector for conventional 110 V electrical service has a pair of spaced apart blades of standard dimensions, each blade having a nominal thickness of about 0.060 inches. The receptacles which receive blades of this type have spring contacts therein which are resiliently spread apart when the blade is inserted to establish electrical contact between the parts. Ideally, blades should be completely rigid and have the physical characteristics of a solid metal blade. It is common practice to attach wires to contact terminals of the type under consideration by crimping the ferrule-forming portions of terminals onto the wires.

It is desirable to minimize the amount of stock metal used to produce blade type terminals for reasons of economy. It is also desirable to manufacture blade type terminals from a relatively thin stock metal for the reasons that a terminal manufactured from thick metal stock cannot be crimped onto a wire. A stock thickness of about 0.015 inches is optimum for crimping onto AWG 12 or 14 wires, the common sizes used for conventional electrical cords.

Folded blade-type contact terminals which achieve the effect of the required 0.060 inches blade thickness with stock metal having a lesser thickness are known to the art; see for example, U.S. Pat. Nos. 3,506,950 and 3,284,758. The present invention is directed to the achievement of blade type contact terminal which permits further reductions in the thickness of the stock metal required for blade manufacture and to the achievement of structural improvements in the finished blade.

It is accordingly an object of the invention to provide an improved folded blade type contact terminal. A further object is to provide a blade type contact terminal which can be manufactured with thin stock metal. A further object is to provide a blade type terminal that requires a minimum amount of stock metal for its manufacture. A still further object is to provide a blade type terminal which can be manufactured in the form of a continuous strip with a substantial spacing between adjacent terminals.

These and other objects of the invention are achieved in a preferred embodiment thereof, which is briefly described in the foregoing abstract, which is described in detail below, and which is shown in the accompanying drawing in which:

FIG. 1 is a fragmentary perspective view of a short section of strip stock metal illustrating the sequence of stamping and forming steps in manufacture of contact blades in accordance with the invention.

FIG. 2 is a perspective view of a contact terminal blade in accordance with the invention crimped onto a wire.

FIGS. 3 and 4 are views taken along the lines 3—3 and 4—4 of FIG. 1.

FIG. 5 is a sectional view of an electrical plug having contact terminals in accordance with the invention therein.

A contact terminal 2 in accordance with the invention comprises a generally flat blade 8 of a predetermined thickness which is crimped at 4' onto the stripped end of an insulated wire 6. Blades in accordance with the invention can be used in standard 110 V electrical cords of the type widely used for ordinary electrical devices. Customarily, contact terminals of this type are manufactured from a 70 Cu - 30 Sn brass strip stock.

Prior to its being crimped onto the wire 6, a contact terminal 2 in accordance with the invention has a generally U-shaped ferrule-forming portion 4 at its rearward end which is connected by a neck portion 5 to a first or lower strip section 10 that extends forwardly from the ferrule forming portion 4. This first or lower strip section 10 is connected by a reverse bend 12 with a second or upper strip section 14 that extends rearwardly towards the ferrule-forming portion 4. At its inner end, this upper strip section extends beyond the lower strip and is bent downwardly as shown at 16, an upwardly directed flange 18 being provided on the extreme end of this section which extends across the ferrule-forming portion.

It should be explained at this point that after the two wires of a cord have been terminated with contact terminals in accordance with the invention, the end portions of the two wires and adjacent portions of the terminals are molded in a plastic housing as shown at 34, FIG. 5. The flanges 18 provide an anchoring surface which serves to retain the terminals in the housing after molding. The two sections of the blade 10, 14 will parallel to each other after the blade has been molded in a housing but they may diverge slightly as shown in the drawing prior to the molding operation as a result of spring-back effects. An aligning hole 20 is provided adjacent to the free end of each blade. These holes are provided for the reception of aligning pin during the molding operation which ensures that the blades will extend parallel to each other in the finished plug connector.

The marginal side edge portions of each strip section 10, 14 are bent inwardly as shown at 22 and are tucked between the upper and lower strip sections 10, 14 as best shown in FIGS. 3 and 4. By virtue of this feature, the blade section 8 of the finished terminal has a thickness which is equal to four times the thickness of the stock metal from which the blade was manufactured. Furthermore, this quadruple stock metal thickness extends along each side of the blade portion 8 for substantially the full length thereof. The blade portion of the terminal is thus extremely rigid throughout its length.

Contact terminal blades in accordance with the invention are manufactured from strip stock metal 26 by punching holes 30 in the stock at the required locations, shearing the stock between its side edges as shown at 32, bending and forming the marginal edges 24' at each blade section upwardly and inwardly as viewed in the drawing, forming the flange and transition sections 16', 18' and finally, bending the lefthand strip section rearwardly towards the ferrule-forming portion 4 as shown. In the finished strip, adjacent terminals are connected to each other by a short section 7 which extends between the neck portions 5 of the ad-

adjacent terminals. These connecting strips are removed when the terminals are crimped onto wires

An ear 28' is struck upwardly in each blank adjacent to the lefthand end of the strip 26. This ear, after folding of the sections 10', 14' into parallel relationship, is located centrally in front of the ferrule-forming portion 4 and functions to prevent the passage of molding material into the space between the upper and lower surfaces of the sections 10, 14 during the molding process. The terminal strip shown in FIG. 1 is manufactured by a progressive forming die having the required punches and forming tooling for the operation shown. It should be mentioned that the progression shown in FIG. 1 is shorter than would be the case in conventional die stamping practice. Ordinarily, the successive forming stages are separated in the die to provide adequate clearance for the tooling at the several stations and the progression will have a length equal to the distance between the first and last stations. The progression of FIG. 1 is shortened for convenience of disclosure but it shows all of the forming steps required to produce terminals in accordance with the invention.

It will be apparent from FIG. 1 that there is very little scrap loss in the manufacture of contact terminals in accordance with the invention. Virtually all of the material between adjacent shear lines 32 is used in the completed terminal except, of course, the material lost in the punching of the holes 30. It should be also noted that the width of each blank is substantially equal to the developed width of the ferrule-forming portion 4, this developed width being indicated at 4' in FIG. 1. In order to obtain a good crimped connection, some minimum developed width of this ferrule-forming portion is required so that the wire will be completely surrounded in the finished crimped connection. This minimum width is often greater than the standard width of the blade portions of the terminals so that in the past, it has sometimes been necessary to use more material for each terminal than the width of the blade in order to provide a ferrule-forming portion of adequate developed width. This prior art method of manufacturing blade type terminals is wasteful of material in that the material between the blade portions of adjacent terminals is punched out as scrap. In accordance with the instant invention, virtually no material between adjacent blanks is lost.

A further significant advantage is achieved in the practice of the invention in that the individual terminals 2 in the strip are spaced apart by a substantial distance notwithstanding the fact that there is, as noted above, virtually no scrap loss in the manufacture of the strip. This substantial spacing between adjacent terminals is highly desirable for the reason that at the time the terminals of the strip are crimped onto wires, good crimping practice requires that the crimping die, which crimps the sidewalls 4 onto the wire, be designed such that its sides surround the sidewalls 4 of the terminal at the completion of the crimping operation. Clearance must thus be provided in the terminal applicator between adjacent terminals for the crimping die and the practice of the invention provides such clearance. Reference is made to U.S. Pat. No. 3,239,924 for a disclosure of one type of crimping die which surrounds the terminal during crimping and which, therefore, requires clearance between adjacent terminals in the strip.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only.

What is claimed is:

1. An electrical contact terminal which is formed from sheet stock metal of a given thickness, said terminal comprising:

a generally U-shaped ferrule-forming portion which is adapted to be crimped onto a conductor, said ferrule-forming portion having a web and sidewalls, a blade portion extending from said ferrule-forming portion, said blade portion comprising a first flat strip section which is integral with, and which extends from, said web,

said first strip being reversely folded at the end of said blade to define a second flat strip section which extends towards said ferrule-forming portion, said second flat strip section extending substantially parallel to, and being spaced from, said first flat strip section,

the marginal edge portions of said first and second flat strip sections on each side of said sections being reversely bent and tucked between said first and second flat strip sections whereby said blade has an effective solid metal thickness which is equal to four times said given thickness and said ferrule-forming portion has the same thickness as said sheet metal stock.

2. A strip of electrical contact terminals, said terminals being in side-by-side spaced-apart relationship, each of said terminals comprising:

a generally U-shaped ferrule-forming portion which is adapted to be crimped onto a conductor, said ferrule-forming portion having a web and sidewalls,

a blade portion extending from said ferrule-forming portion, said blade portion comprising a first flat strip section which is integral with, and which extends from, said web,

said first strip being reversely folded at the end of said blade to define a second flat strip section which extends towards said ferrule-forming portion, said second flat strip section extending substantially parallel to, and being spaced from, said first flat strip section,

the marginal edge portions of said first and second flat strip sections one each side of said sections being reversely bent and tucked between said first and second flat strip sections,

said ferrule-forming portion of each terminal having a developed width which is substantially equal to the pitch of said strip and which is greater than the width of said blade portion, and

adjacent terminals of said strip being connected by connecting neck sections whereby, said terminals are spaced apart along the length of said strip.

3. A method of manufacturing blade type contact terminals from metal strip stock of a given thickness, said terminals having blade portions of predetermined width w and having U-shaped ferrule-forming portions of developed width w' where w' is greater than w , said method comprising the steps of:

feeding strip metal strip stock having a width which is substantially equal to, and slightly greater than,

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twice the length of one of said terminals through a stamping and forming die, forming side-by-side terminal blanks having a width which is substantially equal to w' from said strip stock by shearing partially across said stock , forming said ferrule-forming portions of each blank on one side of said strip stock, bending remaining marginal edge portions of each blank inwardly towards the center of the blank to

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reduce the effective width of each said remaining portions to w , and folding a portion of each blank at a location intermediate the ends of said blank towards said ferrule-forming portion to provide a terminal blade portion of quadruple metal stock thickness in combination with a ferrule-forming portion of stock thickness.

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