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(71) Applicant: **Angelo Campana s.n.c.**
20051 Limbiate (Milano) (IT)

(72) Inventor: **Bogani, Giuseppe**
20051 Limbiate (Milano) (IT)

(74) Representative:
Faraggiana, Vittorio, Dr. Ing.
Ingg. Guzzi & Ravizza S.r.l.
Via Vincenzo Monti 8
20123 Milano (IT)

(54) Process for pressing electrical connector cups with undercut from sheet metal and connector with cup made by this process

(57) A process for pressing electrical connector cups from sheet metal comprises the steps of cutting from sheet metal a generally cylindrical blank with one end open designed to become the head end of the connector, forming the blank by introduction from said open end of forming members for shaping the blank like a mushroom with part of the mushroom wider towards said open end, and inward deformation of the edge of the open end to provide head ends of the connector for passage with reduced diameter. A coaxial electrical connector comprises a mushroom-shaped external cup provided in accordance with the above process, an intermediate insulating layer (30) in the cup and a metallic central member (31) providing the central electrical contact.

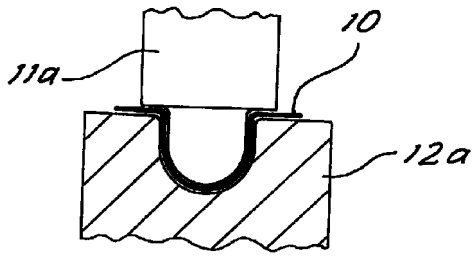

Fig. 1a

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Description

[0001] The present invention relates to the pressing of cups made by sheet metal drawing in particular for electrical connectors.

[0002] In the prior are there are known panel connectors e.g. for connection of coaxial cables and made up of an external cylindrical metal cup surrounding an insulator in the center of which there is a metal bush with elastic connection. Connectors of this kind are used e.g. as automobile radio antenna connectors. On these connectors is connected a complementary movable connector with elastic fingers for connection to the exterior of the cup and a coaxial jack-plug for connection in the bush.

[0003] To permit a firm grip of the elastic fingers the external cup of the panel connector is shaped generally like a mushroom, i.e. with free end having a diameter greater than the base.

[0004] Since the rear opening of the cup is broader than the front or head opening, pressing of the cup takes place from its rear end. Because of the mushroom shape of the head end this necessitates accomplishment of an undercut.

[0005] At present the cup pressing process involves drawing the sheet metal to make a cylindrical socket with closed end which will become the connector head, insertion in the socket of a wedge-shaped expanding template, crushing of the socket exterior to give it the desired shape defined by the template, extraction of the template after its contraction to reduce its diameter to enable withdrawing it from the base of the mushroom, and shearing of the bottom from the lower part of the socket to create the inlet opening for the jackplug into the connector.

[0006] Accomplishment of the wedge-shaped expanding template is complicated especially by the small diameter of about 10mm of the cup. In addition the life of the template is limited by the small size of its component parts and the severe pressing forces. This makes maintenance of the pressing machines particularly costly and reflects on the cost of the connectors produced.

[0007] To reduce the imperfections in the axial symmetry of the cup and permit construction of the wedge-shaped expansion mechanism the pressing takes place with angular steps (e.g. 30° at a time), complicating the pressing operation and introducing imperfections on the cup side-wall).

[0008] The general purpose of the present invention is to remedy the above mentioned shortcomings by making available a pressing method for the cups which would reduce the complexity of the operation while lowering the cost and increasing the life of the pressing machines and the quality of the product obtained.

[0009] In view of this purpose it was sought to provide in accordance with the present invention a process for pressing electrical connector cups with undercut from sheet metal comprising the steps:

- cutting from sheet metal a generally cylindrical blank with an open end designed to become the head end of the connector,
- forming of the blank by introduction from said open end of forming members for shaping the blank like a mushroom with part of the mushroom wider towards said open end, and
- inward deformation of the edge of the open end to provide a connector head end with reduced diameter passage.

[0010] Again in view of the proposed purposes the present invention also concerns a coaxial electrical connector comprising a mushroom-shaped external cup provided by the above mentioned process, an intermediate insulating layer (30)in the cup and a central metal (31) member providing the central electrical contact.

[0011] To clarify the explanation of the innovative principles of the present invention and its advantages compared with the prior art there is described below with the aid of the annexed drawings a possible embodiment thereof by way of non-limiting example applying said principles. In the drawings:

FIG 1 shows a diagrammatic view of processing steps of the process in accordance with the present invention,
FIG 2 shows a diagrammatic view of a possible variant of the process, and
FIG 3 shows a side view of a connector with cup pressed by the process claimed herewith.

[0012] With reference to the FIGS FIG 1 shows the steps of a pressing process in accordance with the present invention.

[0013] The first operation is drawing the blank by means of a punch and die starting from a flat metal sheet 10. The operation can be performed in a single pass or in two steps to have a first step (FIG 1a) for forming and a second step (FIG 1b) for finishing using respectively punches 11a, 11b and dies 12a, 12b. Each step can include several operations. In this manner a socket 13 is produced.

[0014] The next step is to cut off the bottom of the socket (FIG 1c) to open a passage for the future connecting coupling.

[0015] Then one proceeds to straighten the bottom (FIG 1d) to obtain a tubular shape with a completely open end. In this manner an appropriately shaped tool 14 can be inserted from the head end to enlarge the cylinder towards said end (FIG 1e). A subsequent sizing operation (FIG 1f) performed with sizers 15, 16, 17, 18 takes the blank to the final lateral shape. Lastly, a forming tool 19, 20 bends the open end to obtain the head edge 21 of the connector.

[0016] The operations described are shown dia-

grammatically with each one being readily imaginable to those skilled in the art on the basis of the description given.

[0017] Variations in practical accomplishment can be imagined.

[0018] For example in place of forming with an enlarging tool 15 roll forming with rolling cams 22 and external template 23 could be provided.

[0019] At the end of the various operations there is obtained the connector cup 24 as shown for example in FIG 3 with the head end having a passage 25 for the jackplug of the complementary connector (not shown), the mushroom swelling 26, the narrowing base 27 and the base plate 28, equipped if necessary with a connecting tongue 29 by means of a shearing and bending operation. In the cup will then be inserted an intermediate insulator 30 and a metal member 31 for the central electrical contact.

[0020] It is now clear that the predetermined purposes have been achieved by making available a production process allowing machining of the cup without having undercuttings during forming and thus avoiding the use of complex expanding templates or the like as is necessary in accordance with the prior art. The connector obtained has very small dimensional tolerances while substantial surface or form defects are absent.

[0021] Naturally the above description of an embodiment applying the innovative principles of the present invention is given by way of non-limiting example of said principles within the scope of the exclusive right claimed here.

[0022] For example the exact shape of the forming tools will vary depending on specific requirements. Although the solution proposed in FIGS 1c, 2d was found advantageous, shearing of the cup bottom to create the open end of the blank could also be done flush with the side walls to avoid the straightening operation of FIG 1d.

Claims

1. Process for pressing electrical connectors cups from sheet metal comprising the steps:

   - cutting from sheet metal a generally cylindrical blank with an open end designed to become the head end of the connector,
   - forming of the blank by introduction from said open end of forming members for shaping the blank like a mushroom with part of the mushroom wider towards said open end, and
   - inward deformation of the edge of the open end to provide a connector head end with reduced diameter passage.

2. Process in accordance with claim 1 characterized in that the cylindrical blank is obtained by drawing a metal sheet to obtain a cup whose bottom is sheared to become said open end.

3. Process in accordance with claim 2 characterized in that the shearing is done on the cup bottom by shearing a bottom zone having a diameter less than the cup diameter with there being applied to the cup bottom a subsequent straightening step to make it coplanar with the cup walls.

4. Process in accordance with claim 2 characterized in that the drawing is performed in at least two steps, to wit a first step of roughing and a second step of finishing.

5. Process in accordance with claim 1 characterized in that the forming step is accomplished by peripheral rolling of the blank on said forming members.

6. Process in accordance with claim 1 characterized in that the forming step is accomplished by expansion of the blank caused by introduction of said forming members.

7. Process in accordance with claim 1 characterized in that the forming step is followed by a sizing step for the formed blank.

8. Coaxial electrical connector comprising a mushroom shaped external cup produced in accordance with any of claims 1 to 7, an intermediate insulating layer (30) in the cup and a central metallic member (31) providing the central electrical contact.

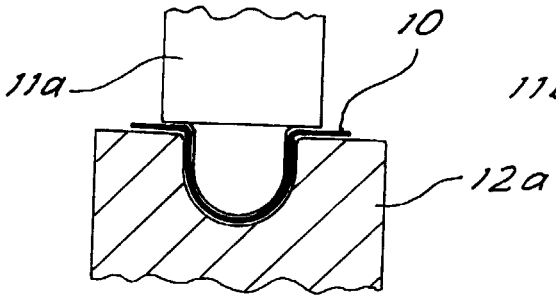

Fig. 1a

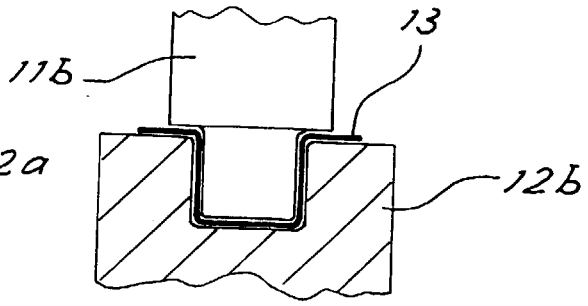

Fig. 1b

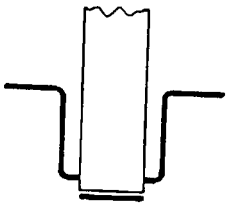

Fig. 1c

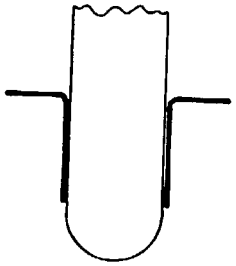

Fig. 1d

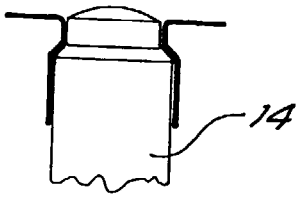

Fig. 1e

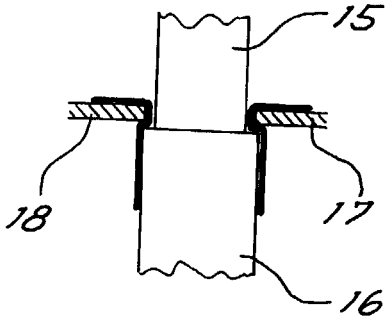

Fig. 1f

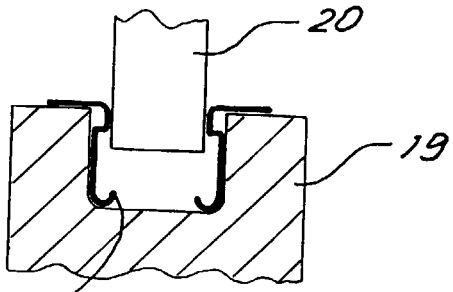

Fig. 1g

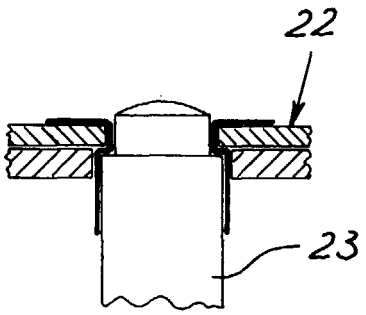

Fig. 2

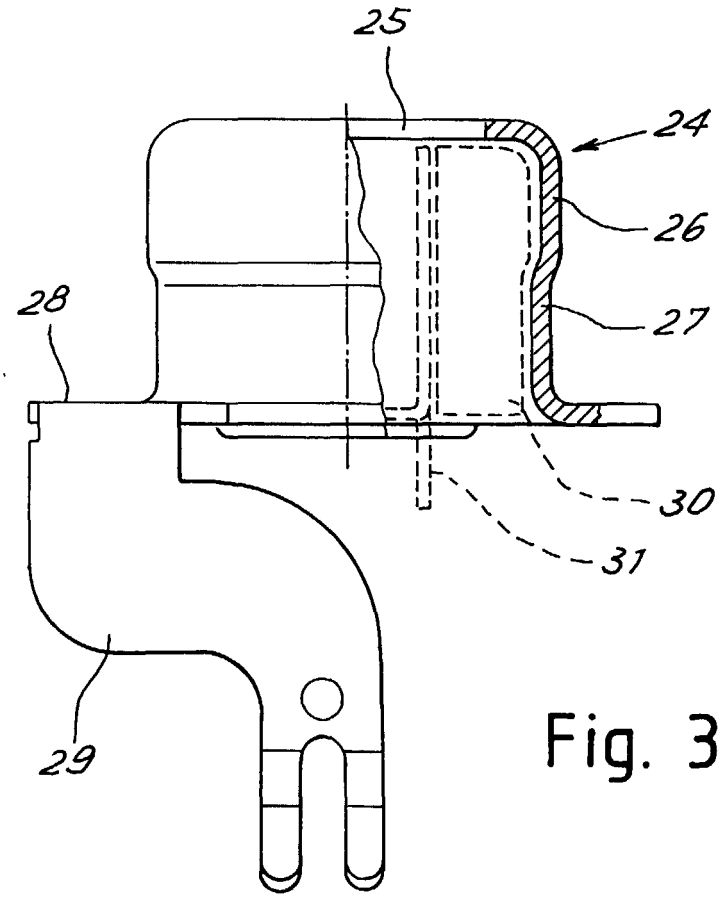

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 0002

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 3 643 203 A (B.J.MCLAUGHLIN ET AL) 15 February 1972 (1972-02-15)	1-3,6	H01R43/16
Y	* column 2, line 13 - line 62; figures 1A-8 *	5,8	
A		4	

Y	PATENT ABSTRACTS OF JAPAN vol. 12, no. 469 (E-691), 8 December 1988 (1988-12-08) & JP 63 188000 A (MURATA), 3 August 1988 (1988-08-03) * abstract *	5,8	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	9 March 2000	Alexatos, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 20 0002

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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09-03-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82