April 26, 1960 C. V. PELLIER 2,934,128

METHOD OF CRIMPING MOUNTED ELECTRICAL CONNECTORS

Original Filed March 31, 1953 2 Sheets-Sheet 1

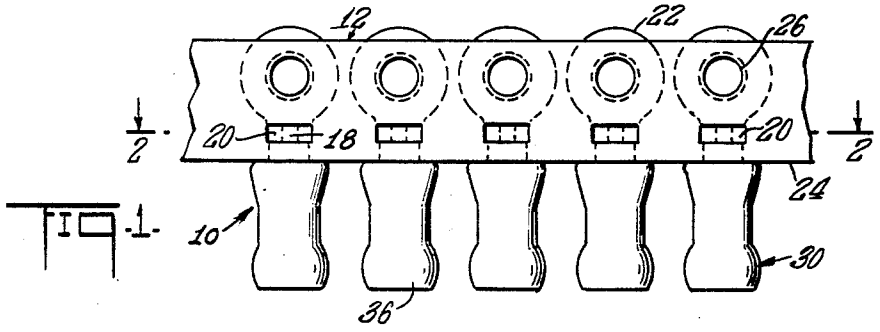


FIG. 1.

FIG. 2.

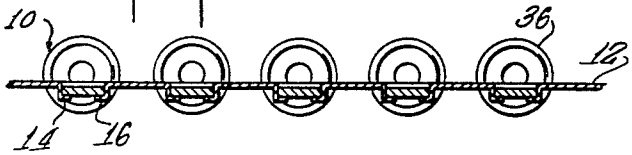
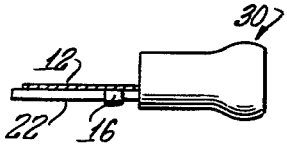


FIG. 3.



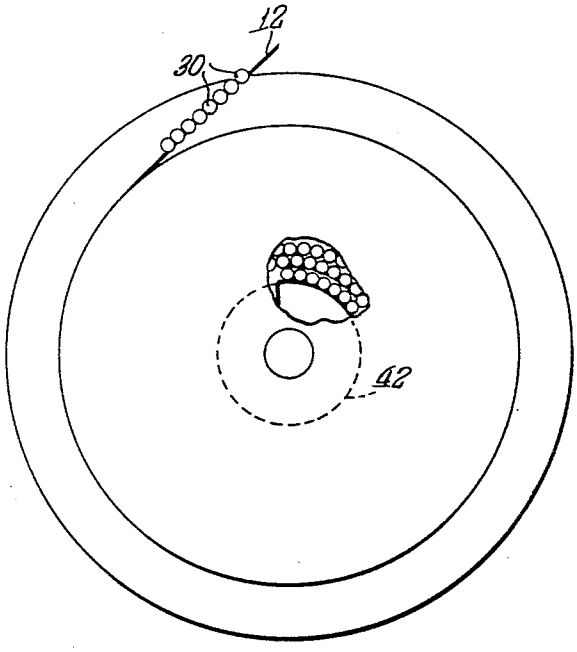


FIG. 10.

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FIG. 4.

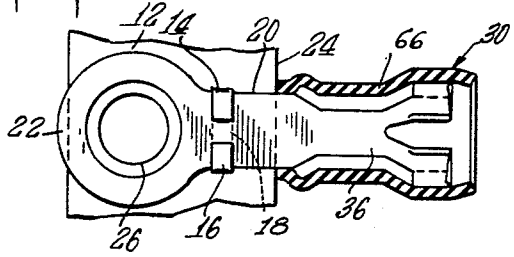


FIG. 5.

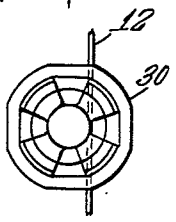
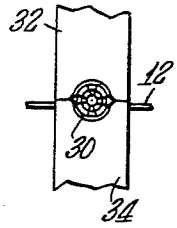


FIG. 7.



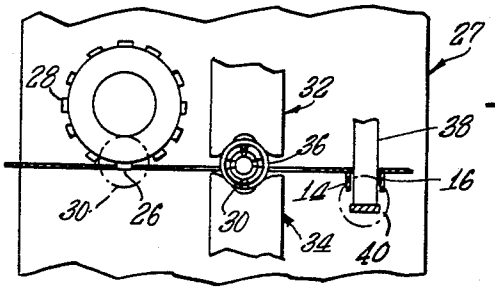
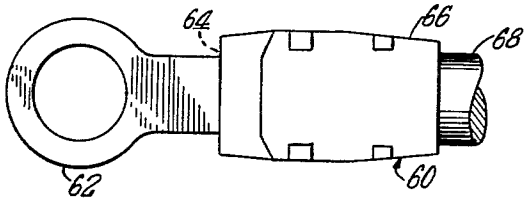


FIG. 6.

FIG. 8.



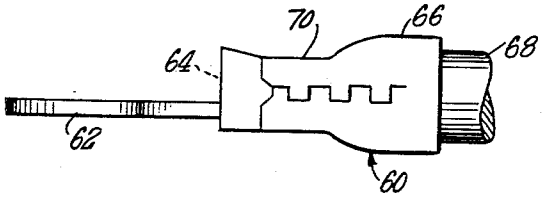


FIG. 9.

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METHOD OF CRIMPING MOUNTED ELECTRICAL CONNECTORS

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Original application March 31, 1953, Serial No. 346,008, now Patent No. 2,815,124, dated December 3, 1957. Divided and this application August 13, 1957, Serial No. 679,546

2 Claims. (Cl. 153—1)

My invention relates to a method of crimping mounted electrical connectors to secure electrical conductors to the connectors an more particularly to an electrical conductor crimping method utilizing coil mounted electrical connectors.

This application is a division of my application Ser. No. 346,008, filed March 31, 1953, now Patent No. 2,815,124.

Hitherto such connectors have been partially formed permitting a unitary attachment of the connectors into a strip of the original sheet metal material from which they are formed. These are then sheared apart in the crimping machine in the final step of separation. Consequently there is left on each connector a sheared edge which may form a sharp cutting edge or burr, depending on the condition of the cutting tool. This edge exposes the inner surface of the metal part subjecting it to corrosion in contrast to the rolled and harder surface of the original sheet metal. Moreover, if the connectors are plated with a corrosion resisting material such as a cadmium plate, the sheared edge will be unplated and unprotected.

Other serious objections to this type of feeding strip are present. The shearing or separating tool requires frequent sharpening and this necessitates a work stoppage. If the shearing tool breaks, this major repair causes a substantial delay in production. The shearing tool furthermore is a hazard in the operation of the machine if operated by a careless workman.

The burr on the sheared edge prevents a flat stacking of connector tongue sections and increases the electrical resistance. Should a defective connector appear in the strip, its removal is impossible without breaking the strip. Only a single size of connector is possible in such a strip, whereas production may require alternate or different combinations of sizes. Where large terminal tongues are required and the barrels are small, a waste in material results because of the requirement that all barrels be positioned on the same side. Finally, if the connector comprises several loose parts fitted together, such construction is not conveniently possible with present methods. In view of the large advantages which are obtained from using these coil mounted connectors, it is desirable to have a machine for rapid installation of such connectors.

The principal object of my invention is to provide an electrical connector crimping machine which can rapidly attach a coil mounted electrical connector to a conductor. Other objects are to provide an installation machine with means for regulating the advance of the feed strip, especially if different sized articles are mingled on the same strip.

I accomplish these and other objects and obtain my new results as will be apparent from the device described in the following specification, particularly pointed out in the claims, and illustrated in the accompanying drawing, in which:

Fig. 1 is a top plan view of a strip of my invention upon which are positioned and secured electrical terminal connectors.

Fig. 2 is a longitudinal elevation taken through the plane 2—2 of Fig. 1.

Fig. 3 is an end view of the same.

Fig. 4 is a top plan view of the mounted connector with the insulating sleeve shown in section.

Fig. 5 is another end view of the mounted connector.

Fig. 6 is a diagrammatic representation of the movement of the strip of my invention into a crimping machine wherein electrical conductors are inserted and crimped connections automatically removed from the strip.

Fig. 7 is a diagrammatic representation of the crimping dies in crimped position.

Fig. 8 is a top plan view of the crimped connection.

Fig. 9 is a side elevation of the same.

Fig. 10 is a side view of a reel showing the strip spirally positioned thereon.

In my invention, the articles **10** are preferably formed, plated, coated, and ready for further processing. The articles are mounted to the strip **12** and suitably secured thereto. In Figs. 1 to 3 such strip is made of metal that is easily bendable and as inexpensive as possible. An example is metal, .008" x 3/8" made of low carbon steel, 1/4 hard, preferably japanned, lacquered, or otherwise protectively coated, if required. Material of similar characteristics may be made of plastic or paper.

In my preferred construction, I secure the article to the strip by a pair of prongs or clasping means **14** and **16** which may be formed by an H type of slot **18** in the strip. The prongs are suitably proportioned to grasp the article in a convenient region, and in the article illustrated, the neck **20** is selected since it is positioned confronting the strip **12** to permit the connector to be gripped in a manner which prevents transverse motion and causes an automatic alignment of all the connectors. The alignment is possible because the tongue portion **22** enlarges beyond the neck **20**, and the barrel **36** enlarges similarly beyond the neck at the opposite end. The locking position is further insured by positioning the connector so that the barrel portion projects normally across one longitudinally extending edge **24** of the strip which provides an aligning means. The connectors are positioned in a machine, not shown, between the prongs which are then folded over as illustrated to confine the connector.

The strip is provided with an advancing control **26** which may be in the form of an aperture, and which a feeler may engage for controlling the proper advance of the strip after each crimping operation. Such an advance through the crimping machine **27** is diagrammatically illustrated in Fig. 6, where a sprocket wheel **28** is shown engaging the aperture **26** employed as the advancing control, thus positioning the connector **30** between the crimping dies **32** and **34**. In this position the bared conductor may be fed into the barrel **36**, and electrically engage a contact, not shown. This causes the press to crimp the connector to the conductor as shown in Fig. 7 and thereafter advance the strip and crimped connector to the next station where the pin **38** pushes the crimped connection **40** away from the strip **12** which forces the prongs **14** and **16** into the open position they were in when the connector was first placed therein. It will be noted that the strip illustrated in Fig. 1 is in the position required for insertion into the machine Fig. 6. This permits the connectors to be freed from the strip by a downward movement of pin **38** through the slot **18**. No damage need be done to the strip which may be reused if desired after a straightening operation.

The sequence of operations is preferably such that with the movement of the pin **38** which frees the completed connection **40**, the crimping dies **32** and **34** just

grip the uncrimped connector 30 as shown in Fig. 6. Connector 30 has previously moved into the crimping position when the crimped connection 40 was advanced to the ejecting position under pin 38. Thus the connector 30 is securely held ready for inserting the bared end of an insulation covered conductor therein as is illustrated.

The strip may be tightly wound on a reel 42, shown in Fig. 10. It will be noted that the strip is positioned on the reel so that the prongs project radially from the strip, towards the center of the reel. The curvature of the reel causes the ends of the prongs to close further about the supported connector. Reversing the curvature will cause the prongs to spread apart, and this phenomenon may be used in a machine to separate the articles from the strip by causing the strip to rotate on a wheel of suitable curvature in the direction that opens the prongs.

The article may be made of two different materials which are assembled before attachment to the strip. Thus, in Figs. 8 and 9 we have illustrated as electrical terminal connector 60 formed of sheet metal into a tongue 62 and rolled up barrel 64, about which may be placed a plastic sleeve 66 which tightly embraces the barrel. Thus when secured to the conductor 68 by the crimp 70, the plastic sleeve 66 extends continuously along the barrel and over the insulation of the conductor, a desirable feature in many cases. Such a composite connector could not be provided in a strip comprising unitarily joined end-to-end connectors.

My strip is useful for transporting articles in predetermined position through a machine or tool for performing any operation thereon.

In the foregoing embodiments of my invention, the various objects have been achieved. The articles may be completely plated or otherwise covered, or coated during manufacture, and secured to my strip without leaving raw edges of uncoated metal which may be sharp and dangerous to handle, unsatisfactory for use and easily corroded. The article may be assembled of diverse parts not made from the connecting strip. My invention provides a more uniform operation through the crimping machine with less cost and delays. Defective articles may be removed before "stripping" or replaced with acceptable articles to insure continuous production even when positioned on the strip. Savings in metal may be obtained by requiring less scrap of high cost connector material. Different sizes or types of articles may be positioned side by side on the strip or in any desired sequence. The articles of the present invention may be tightly rolled on a reel without loosening the articles therefrom. The strip may be fed over a curved surface for freeing its article therefrom. The strip may be reused if desired.

The articles, which may be clasped to the strip by prongs 14, 16 in the machine that provides the final step to the manufacture of the strip, may be thinner, more easily bendable, and less costly than the usually thicker stock from which electrical connectors are made. A damaged strip need not cause a damage to the articles which may be recovered therefrom. The crimped connectors may be retained on the strip with the attached conductors, if further need for sequential operation is required, or if a positioned alignment is useful.

I have thus described my invention, but I desire it understood that it is not confined to the particular forms or uses shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of my invention, and, therefore, I claim broadly the right to employ all equivalent instrumentalities coming within the scope of the appended claims, and by means of which, objects of my invention are attained, and new results accomplished, as it is obvious that the particular embodiments herein shown and described are only some of the many that can be employed to attain these objects and accomplish these results.

I claim:

1. The method of crimping electrical connectors onto electrical conductors comprising the steps of providing a flat strip of flexible material having a series of pairs of longitudinally spaced clasping means extending from and underlying the lower surface of said strip, positioning a plurality of electrical connectors underneath respective parts of said clasping means and clasping said connectors to said strips thereby, said connectors being positioned with a neck portion confronting the strip and a barrel portion extending laterally beyond one edge of the strip to permit each connector to be crimped on opposite sides of its barrel portion to a conductor wire while clasped to said strip, supporting said strip and clasped connectors, intermittently advancing said supported strip to position a connector between crimping dies, positioning an electrical conductor in a barrel of said connector, crimping both sides of said barrel portion of each of said electrical connectors to a conductor while said connector is clasped to said strip.

2. The method in accordance with claim 1 which further includes the step of freeing said connector from said strip when said connector is crimped to a conductor.

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