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METHOD OF MAKING ELECTRICAL CONTACT BLADES

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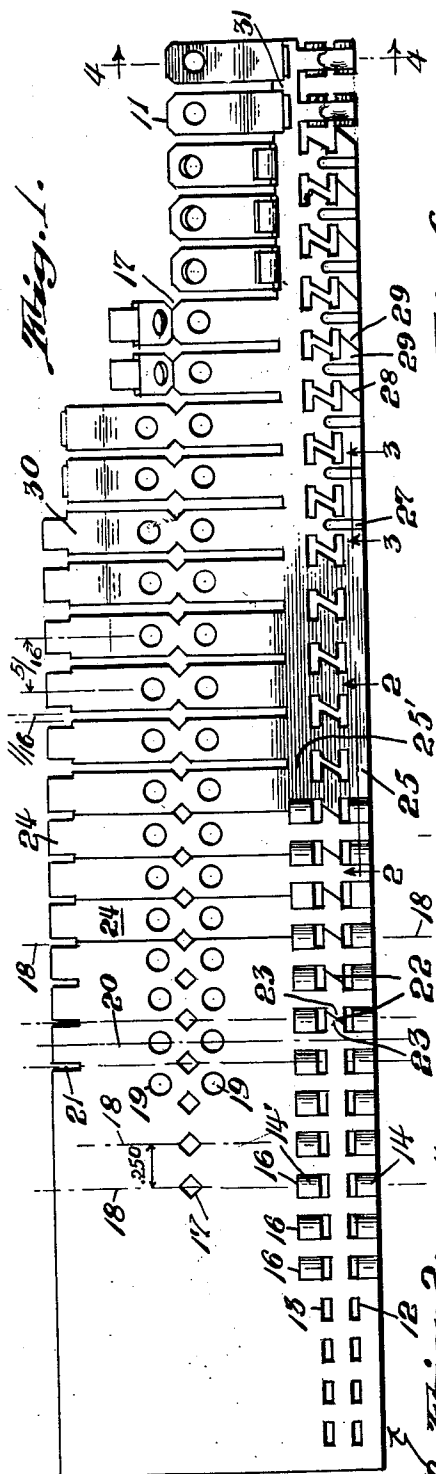


Fig. 1.

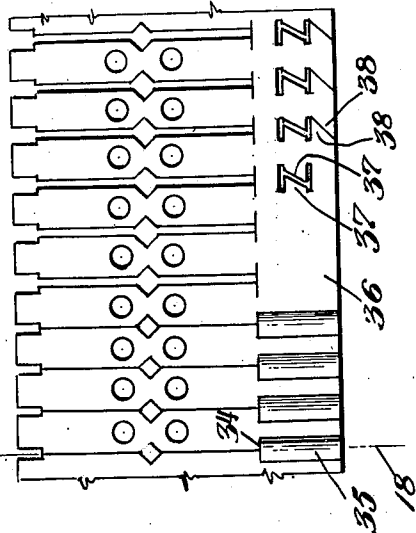


Fig. 6.



Fig. 3.



Fig. 5.

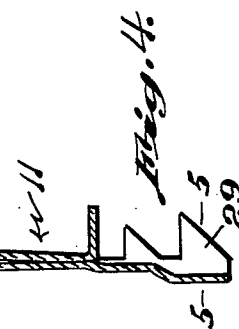


Fig. 4.

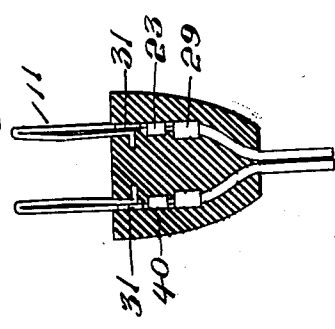


Fig. 7.

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METHOD OF MAKING ELECTRICAL CONTACT BLADES

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4 Claims. (Cl. 113—119)

This invention relates to an improved method of constructing electrical contact elements or blades for plugs at the ends of electrical cables.

Contact blades of this general character are constructed with two pairs of arms at one end thereof for attachment to a cable. The trade requires the blade to be $\frac{1}{4}$ of an inch in width. The outer pair of arms, which are adapted to grasp the insulation, is of a dimension such they cannot be stamped from stock $\frac{1}{4}$ inch in width. With a view of eliminating waste of material, it has been proposed to stamp the blades on $\frac{1}{4}$ inch centers and to stamp the outer arms in such a manner that the end portion of the said arms will enter beyond the confines of the edges of the blade proper and thus overlap into the stock of the adjacent blades. The amount of overlap into the stock of adjacent blades for practical reasons is very limited and confines the stamping-out of said arms to definite limits. Another practice requires that the blades be spaced on centers greater than $\frac{1}{4}$ inch to secure sufficient stock for the outer arms, which practice results in a waste of stock material that must be punched out to yield blades $\frac{1}{4}$ inch in width.

An object of the invention is to construct contact blades in strip form on $\frac{1}{4}$ inch centers and to stamp the outer arms of the blade of a required dimension without encroaching on the stock of adjacent blades.

Another object is to construct contact blades in strip form on $\frac{1}{4}$ inch centers which will be joined to each other at a location which, when the blades are severed, the severed portion will be inwardly of the mold line of the plug.

A more specific object is to construct contact blades in strip form on $\frac{1}{4}$ inch centers and to expand the material on one side of the blade body to provide sufficient material to stamp the arms of the blade.

With these and other objects in view, the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a plan view of a strip of sheet material illustrating various steps of constructing a plug contact blade embodying my invention;

Figure 2 is a sectional view taken substantially along line 2—2 of Figure 1;

Figure 3 is a sectional view taken substantially along line 3—3 of Figure 1;

Figure 4 is a central longitudinal view of a contact blade;

Figure 5 is a sectional view taken along line 5—5 of Figure 4;

Figure 6 is a plan view of a sheet metal strip showing a modified step in constructing a contact blade; and

Figure 7 is a central longitudinal sectional view through a plug with the contacts embedded therein.

In accordance with the invention the contact blades are constructed in strip form from which the finished contacts

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may be thereafter severed. The various steps involved in the construction of the contact may be conveniently carried out by means of a usual tool press and by various combined operations performed simultaneously at different stations on a strip of material that is fed through the press, wherein the blade is stamped, arms are bent, and the body of the blade folded to form.

The blade is fed through the press as by means of a step by step feed and advanced $\frac{1}{4}$ of an inch at each feeding. Thus, the blades are stamped on $\frac{1}{4}$ inch centers between blades, and the required width of blade may be severed without loss or waste of material. Prior to severing of the blade, the stock at the arm end of the blade is expanded as by means of raising the stock on each side of a line defining the edges of adjacent blades. The stock may be raised by a combined severing and drawing operation in two loops with their side edges free of the strip. In drawing the loops, the material of the loops will be stretched and expanded lengthwise. The inner arms of the blade are formed in the space between the loops and may be severed in a subsequent operation as by means of a cutting tool by which the stock is severed along a diagonal line extending to the severed sides of the loop. Thus, an inner arm for each adjacent blade is provided. The strip may be now severed along the line defining the edges of adjacent blades and extending to the inner side of the inner loop. Thus, adjacent blades are attached to each other only by the said loops. Then by pressing the loops flat into the plane of the strip, the expanded but thinner portion of the material in the loops will cause a separation of adjacent blades a distance depending upon the height to which the loops are raised. The edge of the strip at the arm end of the blades will now have an increase in length equal to the spacing between the edges of adjacent blades which will provide material for forming the lower arms of the blade without encroaching within the confines of the edges of adjacent blades. Thus, I am able to construct a contact blade on $\frac{1}{4}$ -inch centers with an outer pair of arms comparable in length to the similar pair of arms formed on a contact blade constructed on $\frac{5}{16}$ -inch centers. In practice the loops are raised a distance to provide $\frac{1}{16}$ of an inch spacing between blades when the loops are flattened as above described. It will be apparent that I may even provide longer outer arms should the same be desirable by encroaching slightly within the confines of adjacent blades, or I may raise the loops higher to provide the necessary stock to stamp the outer arms therefrom.

Referring to Figure 1, 10 designates a strip of sheet metal having a width equal to the over-all length of the contact element or blade and of a material that has a low resistance to the passage of electric currents. The various steps or operations in making the blade are illustrated in a preferred sequence, which may be altered in part depending upon conditions and equipment available. Preferably a usual press is employed in which the various tools are spaced from each other the proper distances and which operate simultaneously each at its station to perform some particular operation, which, when combined with prior and subsequent operations, will form complete blades 11, as shown at the right end of the strip 10, the strip being advanced from left to right from a roll supply (not shown).

By a punching operation the strip is first pierced with a pair of rectangular openings 12, 13 at the lower edge of the strip as seen in Figure 1 and in crosswise alignment. The supporting structures of the tools employed for constructing the contact blades determines to a degree the spacing between operations and thus each tool may perform a plurality of like operations prior to the initial portion of the stock having been advanced to a position

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for a next operation. Thus, the strip illustrates a plurality of each of the several operations made on the strip. Since such plurality of each step is merely the result of tool spacing, the description of the various different operations will follow the sequence in which they are made.

The strip 10 is fed through the press step by step and is advanced 0.250 of an inch at each feeding. After the pair of openings 12, 13 have been made, the strip is next subjected to a combined drawing and severing operation so as to raise the material which is located between the lower edge of the strip and lower side of the opening 12 in crosswise alignment therewith in a generally U-shape or loop 14 (see Figure 2). Simultaneously a slit 16 is made inwardly of the opening 13 lengthwise of the strip to extend in crosswise alignment with the openings and the stock or material between this slit and the opening 13 in crosswise alignment therewith is severed on a diagonal 22 from adjacent the upper left corner of opening 13 to adjacent the lower right corner of opening 13 to form an upper prong 23 on adjacent blades. A next shearing operation without waste severs the strip along line 18 from the upper edge of the strip to the slit 16. On a next advance of the strip, a similar shearing operation severs the other side of the blade from the strip and forms the body 24 of the blade.

The strip is now in condition to return the material of the loops 14, 14' back into the plane of the strip as at 25, 25'. With this in view the loops are subjected to a pressing operation to flatten the same in the plane of the strip. This flattening of the loops will cause a separation between severed body portions 24 to space the blade bodies $\frac{5}{16}$ -inch on center with a spacing of $\frac{1}{16}$ -inch between blades. This in effect provides the necessary amount of material required at the lower marginal edge of the strip to form the lower arms of the blade as would be provided if the blades were made on $\frac{5}{16}$ -inch centers. Thus, the usual waste between blades is saved, and this amounts to a considerable saving of material and still provides the necessary material at the lower marginal edge of the strip for the lower arms to be stamped out of the required dimension without encroaching into the stock of adjacent blades.

With a view of further increasing the amount of material for the said lower arms, the lower edge of the strip centrally of the body 24 is depressed to form a recess 27. By a severing operation, the material between recesses 27 in crosswise alignment with the opening 12 is severed along diagonal line 28 to form one of the lower arms 29 of adjacent blades. As the strip progresses through the press, the strip is subjected to folding apparatus to bend the upper portion 30 at the openings 17 upon itself to align openings 18, 19 with each other in the relation best seen in Figure 4. The arms 23, 29 are next formed into U shape, which completes the blade which is attached to a next formed blade by a narrow neck portion 31 by means of which the blades may be furnished in strip form of required length.

Since the blades are connected together at the particular location 31, it will readily be seen that the severed surface will be inwardly of the mold line of a plug to which the blades may be attached. Thus, the severed portion 31 is enclosed within the plug body 40 as shown in Figure 7, which eliminates the necessity of further operation to remove a burr and smooth such severed portion. This plug body may be of the type molded about the blades or of the type to have the blades passed through its outer ends into molded recesses of a size to accept the arm end of the blades and engage the L-shaped projection extending therefrom.

In Figure 6 I have shown a modified construction in which by a combined severing and drawing operation, the strip is slit as at 34 with the slit extending an equal distance on each side of the line 18 and at right angles thereto. The portion of the stock extending from said

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slit 34 to the lower edge of the strip in crosswise alignment therewith is raised in a loop 35 and stretches the material at this location.

The strip is next severed crosswise from the other or upper edge as seen in Figure 6 along the line 18 to the said slit 34. Thereafter the loop is flattened as at 36 which causes a separation of the blades along line 18 as previously described. By means of a Z-shaped punch or like tool, the inner arms 37 are stamped out and the outer arms 38 may thereafter be stamped or severed from the strip as previously described.

The order in which the various steps have been described may be altered depending upon proper machine shop practice in setting up the various tools. It may be also found desirable in some instances to simultaneously pierce the strip with openings 12, 13 and sever the notches 21. It may be desirable in some instances to pierce the openings 19 prior to piercing the openings 17. Thus, the particular order of operation may be changed from that herein shown without departing from the broad concept of the invention.

I claim:

1. In the process of making electrical contact blades in strip form having a pair of arms wider than the width of the blade portion of the contact, the steps of progressively piercing in one marginal edge of a strip of sheet material longitudinally thereof two rows of openings with the openings in one row extending in crosswise alignment with the openings in the other row, shearing slits of finite length inwardly of the inner row of openings and in crosswise alignment with said openings, severing said strip along a diagonal line extending generally adjacent one corner of the inner opening to adjacent the opposite corner of the outer opening, shearing said strip without waste from the other edge thereof to said slit along a line extending crosswise of said strip and centrally of the slits and said openings into blade portions connected at their inner end to said marginal edge, expanding lengthwise of the strip the portions thereof extending between the slits and inner row of openings in crosswise alignment therewith and the portions of the strip extending between the lower row of openings and the adjacent edge of the strip in crosswise alignment with the lower openings so as to increase the length of the marginal edge of the strip and thereafter severing between the outer opening and the adjacent edge without waste the said expanded portion of the marginal edge on a line substantially parallel to the slit between said openings.

2. In the process of making a strip of electrical contact blades from a strip of sheet material on centers spaced the width of the blades and in which the contact has a pair of arms wider than the width of the blade, the steps of progressively cutting spaced slits lengthwise of the strip in one marginal edge thereof and parallel to the edges of the strip, severing said strip without waste inwardly from the other edge to said slit along a line extending crosswise and centrally to said slits into blade portions, expanding the portion of the strip between said slit and adjacent edge of the strip in crosswise alignment with said slits to separate and space said blade portions a distance greater than the width of said blades and thereafter severing arms from the said expanded portion of the strip by cutting spaced slits parallel to the marginal edge with a diagonal slit therebetween on an angle such that at least one end of the diagonal slit extends to the adjacent spaced blade.

3. In the process of making electrical contact blades from a strip of sheet material on centers spaced the width of the blades, the steps of progressively piercing in one marginal edge of the strip two rows of rectangular openings with the openings in one row extending in crosswise alignment with the openings in the other row, making slits without waste inwardly of the inner opening and in crosswise alignment with said openings, drawing into a loop the portion of the strip between and in crosswise alignment

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with the outer openings and the adjacent edge of said strip, simultaneously drawing into a loop the portion of the strip between and in crosswise alignment with said slit and the inner openings, severing the strip between said openings along a diagonal line extending from the openings in one row to the openings in the other row, severing said strip without waste from the other edge thereof inwardly to said slit along a line extending crosswise centrally through said slits and openings into blade portions connected at their inner ends to said marginal edge, flattening said loops back into the plane of said strip to expand said strip lengthwise to separate and space the severed blade portions a distance greater than the width of said blades, and thereafter severing without waste the said arms in the said expanded portion of the said marginal edge along a line substantially parallel to the slit between said openings.

4. In the process of making electrical contact blades from a strip of sheet material on centers spaced the width of the blades and in which the contacts have a pair of arms wider than the width of the blade portions, the steps of progressively piercing in one marginal edge of the strip two rows of rectangular openings with the openings in one row extending in crosswise alignment with the openings in the other row, making slits without waste inwardly of the inner row in crosswise alignment with the openings thereof, drawing into a loop the portion of the strip extending between and in crosswise alignment

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with the outer opening and the adjacent edge of said strip, simultaneously drawing into loops the portion of the strip between and in crosswise alignment with said slit and the inner openings, severing the material between said openings diagonally from one corner of the inner openings to an opposite corner in the outer openings, severing said strip from the other edge thereof inwardly to said slit and without waste along a line extending crosswise centrally through said openings into blade portions, flattening said loops back into the plane of said strip to expand said strip lengthwise to separate and space the severed blade portions a distance greater than the width of said blades, then severing between the outer opening and the adjacent edge without waste the expanded portion of the strip along a line substantially parallel to the slit between said openings into an arm portion.

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