Jan. 6, 1953

J. A. PAYETTE

2,624,820

ELECTRICAL CONTACT

Filed Jan. 14, 1950

2 SHEETS—SHEET 1

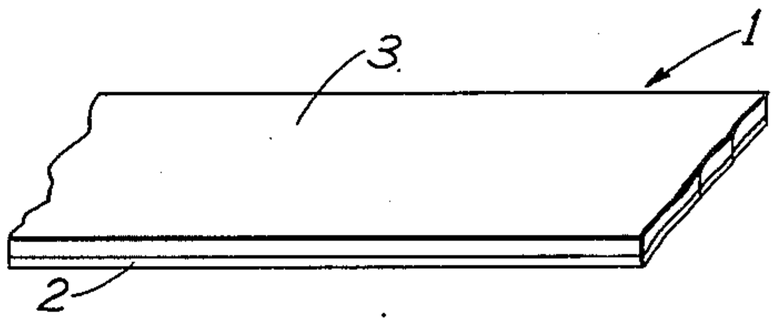

Fig. 1.

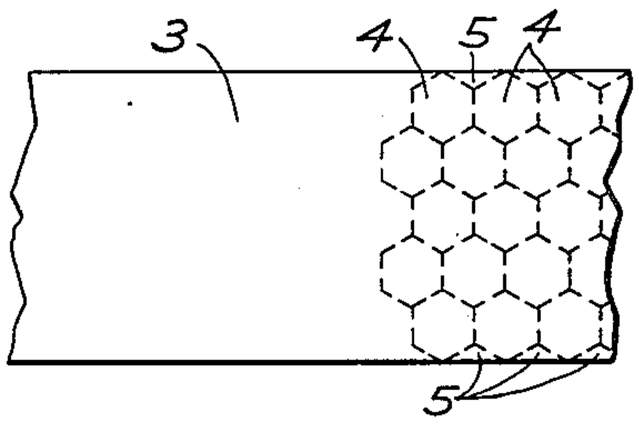

Fig. 2.

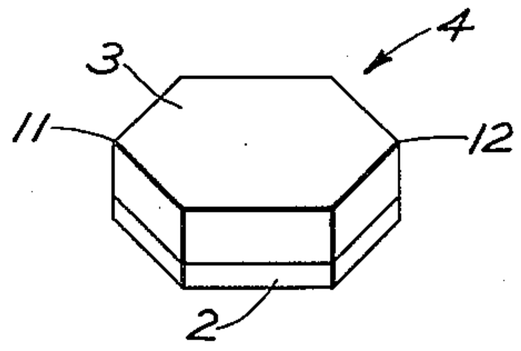

Fig. 3.

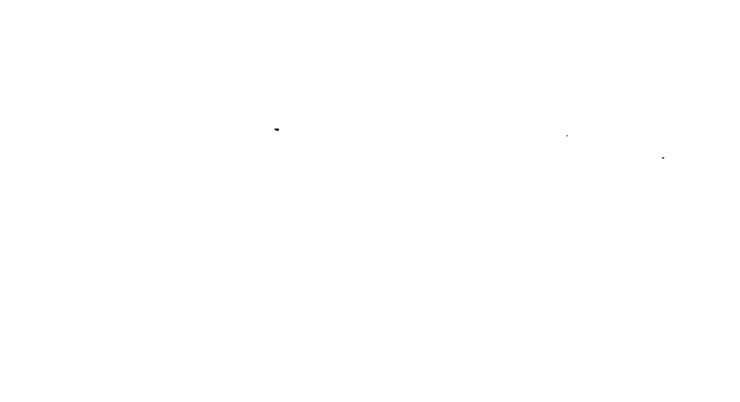

Fig. 4.

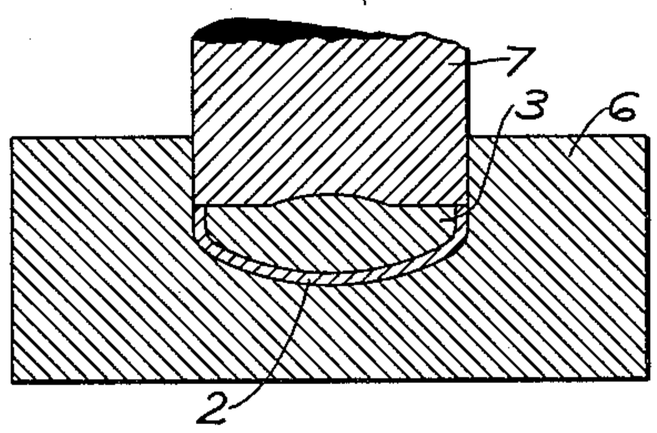

Fig. 5.

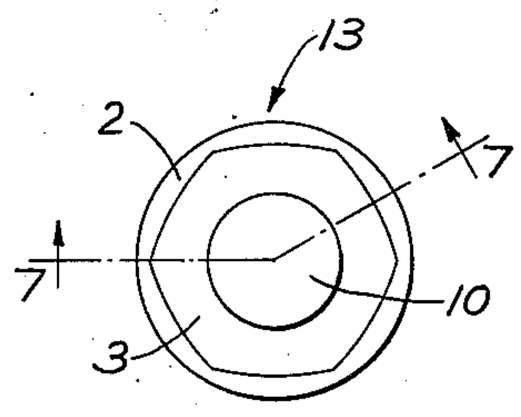

Fig. 6.

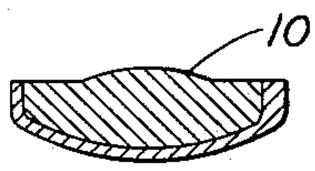

Fig. 7.

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ELECTRICAL CONTACT

Filed Jan. 14, 1950 2 SHEETS—SHEET 2

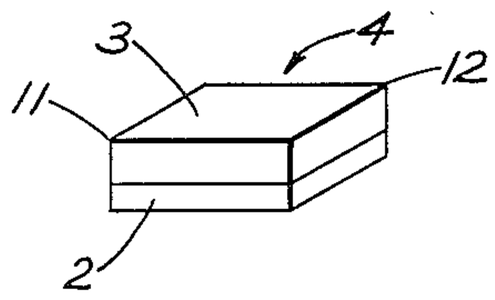

Fig. 8.

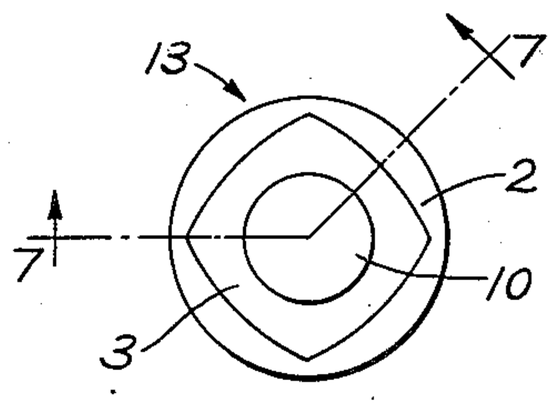

Fig. 10.

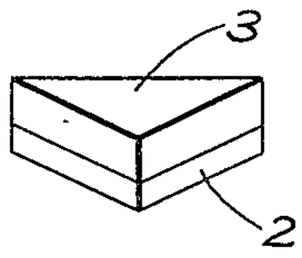

Fig. 9.

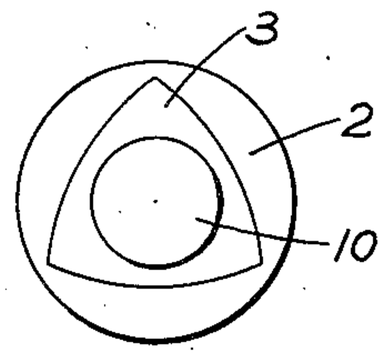

Fig. 11.

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ELECTRICAL CONTACT

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Application January 14, 1950, Serial No. 138,572

10 Claims. (Cl. 200—166)

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This invention relates to a method of manufacturing electrical contacts, and to the contact produced thereby. In particular, it relates to laminated type electrical contacts and a method of making them.

Among the several objects of the invention may be noted few and simple operations such as blanking and coining; the provision of a new and useful electrical contact of the flat or button type suitable for welding to supporting members; and the provision of a contact of the class described in which the material forming the contact face is allocated on surface and sides of the contact in a predetermined manner. Other objects of the invention will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combination of elements, features of construction, and arrangements of parts, which will be exemplified in the accompanying drawings, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which are illustrated several embodiments of the invention:

Fig. 1 is a perspective view of laminated sheet stock material for use in the method and contact of this invention;

Fig. 2 is a plan view of the sheet stock of Fig. 1, showing by dotted lines how contact blanks of a preferred type are punched from the sheet stock;

Fig. 3 is a perspective view of a contact blank resulting from the punching operation indicated in Fig. 2;

Fig. 4 is a cross-section of a coining die showing the contact blank of Fig. 3 placed therein preparatory to coining;

Fig. 5 is a view similar to Fig. 4, but showing the coining press closed and forming, on the contact blank of Fig. 3, the final contact;

Fig. 6 is a bottom plan view of a finished contact of this invention;

Fig. 7 is a cross-section of the contact of Fig. 6 taken along line 7—7;

Figs. 8 and 9 show contact blanks of other embodiments of this invention; and

Figs. 10 and 11 are bottom plan views of, respectively, finished contacts made from the blanks of Figs. 8 and 9.

Similar reference characters indicate corresponding parts throughout the several views of the drawing.

In the manufacture of contacts where the contacts are punched out from laminated sheet stock (for example, sheet stock consisting of silver on one side and a base metal such as steel on the other side), one of the problems encountered is that of scrap, where the final contacts are to be of circular or oval shape, or of some other shape, such that the contact blanks do not "nest" in edge to edge relation in the sheet stock. In such cases, scrap metal will be left between the contact blanks. For example, in the case of substantially circular blanks, with each blank there is associated a piece of scrap. This scrap metal is laminated, and refining it to recover the silver or other precious metal used as the contact face adds to the cost of making the contacts. It is a purpose of this invention, therefore, to provide a method of making such contacts which leaves a minimum of scrap.

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Another difficulty often experienced comes in the coining operation where the contact blanks are coined to produce, for example, a rounded contact face. The flow of the silver (or other precious metal) on the face of the contact should be controllable so as to be able to govern the amount of precious metal which flows down over the sides of the finished contact, as well as the thickness distribution of precious metal across the contact face. (Flowing over the sides is desirable to keep the sides from corroding.) In many of the prior methods of making contacts where attempts have been made to control the scrap, neither of these factors is controllable to any great degree, and it is a further purpose of this invention to provide a substantially scrapless method of manufacture of contacts which incorporates such control.

Referring now to the drawing, there is shown generally at 1 a sheet of laminated contact stock which may be used in the fulfillment of this invention. The laminated stock per se is not a part of this invention. Stock 1 comprises in this instance (and only by way of example) a layer 3 of base material such as steel bonded to a layer of contact face material 2 such as silver. Such material as this and its construction are well known in the art and need not be further detailed here. Instead of being two layers, material 1 may have three or more layers, as the requirements demand. Other base metals that may be used are iron, stainless steel, Monel, nickel. These metals, together with steel, all have a relatively high resistance which makes them suitable for resistance welding.

Starting with the sheet stock 1 described above, the steps of this invention consist of punching contact blanks 4 from the stock and coining the blanks into the final desired shape of contact.

Referring now to Fig. 2, a plan view of the sheet stock of Fig. 1 is shown, and there is indicated thereon by dotted lines, the manner in which contact blanks 4 are to be punched from the stock. The blanks 4 are shown in this instance as hexagonal in shape, and by the use of this shape one of the desired objects of the invention is realized. Hexagons will nest together, and may be punched out as indicated in Fig. 2, without leaving any scrap between blanks. This hexagonal shape is the preferred embodiment of my invention.

The punching operation indicated in Fig. 2 results in contact blanks 4 being formed, and each of these blanks is now coined or stamped into the required contact shape as follows. A pair of dies 6 and 7 is provided. The bottom 8 of female die 6 is rounded to give the required contact face shape. The male die 7 is likewise rounded as shown at 9 to provide a projection 10 on the back of the finished contact, in the event the button is to be attached to supports, etc. by resistance welding. The cross-sectional shape of dies 6 and 7 is circular in this instance where the final contact button is desired to be circular; but dies 6 and 7 may be other shapes, regardless of the fact that blank 4 is hexagonal, if the shape selected is greater in size than a diagonal of blank 4, but not too much greater.

It will be noted that the maximum diameter of blank 4 (across any corners 11 and 12) is slightly less than the diameter of the female die 6. The purpose of this is to leave room for the silver 2 to flow over the corners of the square blank to cover the base metal. This flowing takes place as the dies are brought together, as shown in Figure 5, and occurs because the silver 2 is softer than the backing metal 3. The crowning action of the dies 6 and 7 can be used to provide most of the silver at the center of the contact, and the amount of silver is controllable by varying the ratio of thickness of silver 2 to steel 3 in the sheet stock 1, by the radius of curvature of the bottom of die 6, and by the ratio of the diameter of die 6 to contact blank 4.

The flowing action of the silver results in the die 6 being filled and consequently the final contact 13 takes the shape of die 6. The hexagonal shaped backing material may or may not become deformed in this coining operation, depending on the relative ductility of the two metals of sheet stock 1. In the case of silver on steel, it will be observed that the steel backing retains almost all of its hexagonal shape, with only a slight bowing or rounding outward of the sides of the hexagon. (This may be seen by reference to Fig. 6, where the sides of the steel back are shown as slightly bowed.) Since this is the case, the silver forming the sides of the contact varies in thickness around the sides, being thinnest at the corners of the hexagonal shaped steel backing and thickest at the center of the sides. This is indicated in Figures 6 and 7, where in Fig. 6 the hexagonal shape of the steel 3 is shown, and in Fig. 7 the thickness is shown by the cross-section.

The advantages of this invention are also fully realized in the manufacture of so-called "solder-flushed" silver contacts. Such contacts are generally button type, and disc shaped, and on one side have a layer of silver solder, the rest of the contact being generally fine silver. In conventional methods of manufacturing these contacts, where circular contacts are desired, the sheet stock is prepared with its silver solder coating on one side, and then the circular blanks are punched out. The scrap left from the punching operation is relatively costly to refine, since the silver solder is somewhat like the silver in its reaction to refinishing or separating agents. Therefore, the present invention, which largely does away with scrap or minimizes it greatly, has a peculiar advantage in this instance.

If desired, shapes other than hexagonal may be used, provided such shapes will "nest" across the width of the sheet material. As an example of this, Fig. 8 shows a perspective view of a contact blank which is triangular in shape, the triangle being preferably equilateral; and Fig. 10 shows a bottom plan view of the round contact formed from the blank of Fig. 8. Numerals 2, 3 and 10 refer respectively to the contact metal face, the backing layer, and a welding projection. Such triangles will "nest" across the face of the material and may be punched out without leaving any scrap between blanks. If desired, the sheet stock may be first slit into narrow strips, and then by the proper design of the cutting tools, or by proper manipulation of the strip stock, triangle-shaped pieces may be punched off from the strip.

As another example of the practice of this invention, Fig. 9 shows a perspective view of a square contact blank, with Fig. 11 showing the bottom plan view of a round contact formed from the square. Numerals 2, 3 and 10 again refer respectively to the contact face, the backing layer, and a welding projection. The squares of Fig. 9 may be formed, if desired, by slitting the stock and thereafter cutting the squares from these narrower strips.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

I claim:

1. An electrical contact comprising a facing layer of contact metal and a backing layer of base metal superficially secured together, said contact metal layer having a peripheral shape different from the peripheral shape of said backing metal layer.

2. An electrical contact comprising a facing layer of contact metal having superficially united thereto a backing layer of base metal, said facing layer being substantially circular in peripheral shape, and said backing layer having a peripheral shape other than circular.

3. An electrical contact comprising a facing layer of contact metal and a substantially hexagonal shaped backing layer of base metal superficially secured together, said contact metal layer having a peripheral shape different from the peripheral shape of said backing metal layer.

4. An electrical contact comprising a facing layer of contact metal having superficially united thereto a layer of backing metal, said facing layer being substantially circular in peripheral shape, and said backing layer being substantially hexagonal in peripheral shape.

5. An electrical contact comprising a facing layer of silver superficially united to a backing layer of base metal, said silver layer being substantially circular in peripheral shape, and said backing layer being substantially hexagonal in peripheral shape.

6. An electrical contact comprising a facing layer of contact metal superficially united to a backing layer of base metal, said contact metal layer being substantially circular in peripheral shape, and said backing layer being substantially hexagonal in peripheral shape and having at least one projection on its outer face.

7. An electrical contact comprising a facing layer of silver superficially united to a backing layer of ferrous metal, said silver layer being substantially circular in peripheral shape, and said ferrous metal being substantially hexagonal in peripheral shape and having at least one projection on its outer face.

8. An electrical contact comprising a facing layer of silver superficially united to a backing layer of Monel, said silver layer being substantially circular in peripheral shape, and said Monel being substantially hexagonal in peripheral shape and having at least one projection on its outer face.

9. An electrical contact comprising a facing layer of silver superficially united to a backing layer of base metal, said silver layer being substantially circular in peripheral shape, and said

backing layer being substantially square in peripheral shape.

10. An electrical contact comprising a facing layer of silver superficially united to a backing layer of base metal, said silver layer being substantially circular in peripheral shape, and said backing layer being substantially triangular in peripheral shape.

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The following references are of record in the file of this patent:

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