Dec. 13, 1938. M. D. HELFRICK 2,140,131

MANUFACTURE OF FORMED ARTICLES

Filed June 27, 1936

FIG. 1

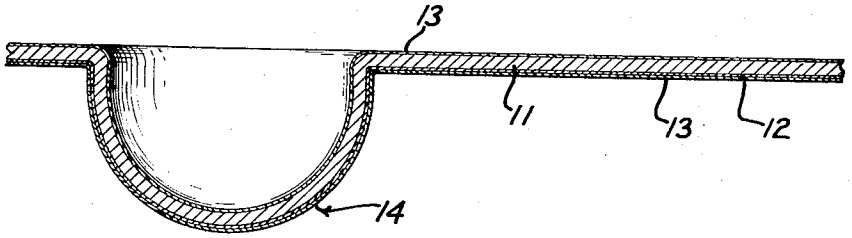
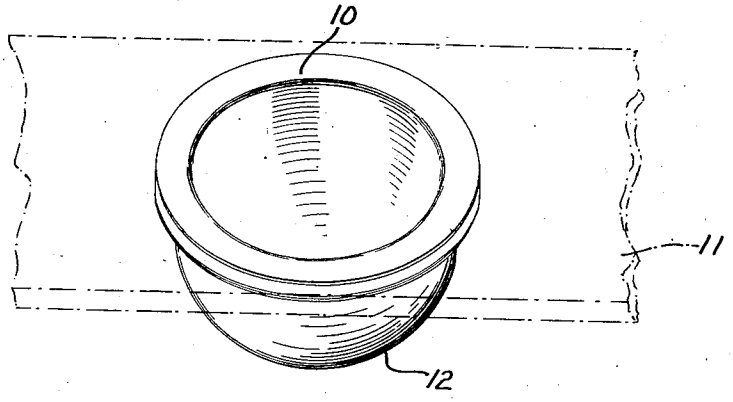



FIG. 2

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## MANUFACTURE OF FORMED ARTICLES

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4 Claims. (Cl. 113—51)

This invention relates to the manufacture of formed articles, and more particularly to improved methods for forming articles from hard sheet material.

In certain types of equipment, such as communication apparatus, it is customary to use metal parts that are bent, formed or drawn into irregular shapes in order to minimize manufacturing costs, save raw material and conserve space in the apparatus. The type of material used for these parts has been restricted by the forming and drawing operations and metals having the characteristics of hardness and stiffness suitable for maximum service utility did not withstand these processes satisfactorily. In cases where sharp bends or deep draws were required the operations could be completed only after the material was annealed, which impaired the hardness rating and consequently the service life.

An object of this invention is to provide economical and efficient methods for the manufacture of drawn and formed articles from hard serviceable materials.

The objects and advantages of this invention are particularly adapted to the manufacture of cup-shaped electrodes used in telephone transmitters which are drawn and punched from brass sheet. The outside surface of this part provides an electrical connection with the carbon in the transmitter and it is desirable to use gold or other noble metal as a contact material. Formerly, these parts were made of 65–35 brass and subsequently plated with gold. Difficulty was encountered in forming the cup-shaped body, due to tearing of the metal, and it was difficult to control the plating action on the irregular surfaces. Also, because the parts are small and fragile, the extensive and careful handling required in the plating operation was expensive.

In accordance with one embodiment of this invention, as applied to the manufacture of transmitter electrodes, a layer of gold is plated on one face of a continuous brass strip, which is then coated with lacquer and formed into parts of the required size and shape, after which the protective coating is removed from the articles with a suitable solvent.

Other features and advantages of the invention will be apparent from the following detailed description taken in conjunction with the accompanying drawing, wherein

Fig. 1 is a sectional view showing a brass strip, having a facing of gold and an external coating of lacquer formed into a cup-shaped body, embodying the invention, and

Fig. 2 is a perspective view of a transmitter electrode formed from the composite strip.

In the first operation involved in the manufacture of a transmitter electrode 10 a strip of brass 11 is cleaned by immersion in a caustic solution or other suitable medium to remove all grease, dirt and other foreign materials. A uniform coating of gold 12 is then applied to one face of the brass strip, preferably by plating. In plating thin material a length of the brass strip is wrapped spirally around an elongated plating rack having an oval section. The surface of the rack is covered with rubber which closely engages the undersurface of the strip and prevents circulation of the plating solution against it to restrict the gold deposit to one face and the two edges of the strip. Thicker material, which does not conform readily to the contour of a rack of convenient size can be plated satisfactorily and continuously by conducting the strip through the plating bath in contact with a partially immersed rubber faced roller of relatively large diameter. The roller is made sufficiently large so that one face of the strip can be held in close contact with the soft rubber facing on the roller, thereby excluding plating solution, and consequently deposited metal, from that area.

After the plating operation is completed by one of these methods the strip is coated with lacquer 13, applied by brushing, spraying or dipping, and permitted to dry. The lacquer is applied to either one or both faces of the material in accordance with the type of forming operation and finish required. The composite strip is next drawn, punched, formed or worked into parts of the required size and shape on a punch press or other conventional machining equipment.

During the drawing of the transmitter electrode the thin stock is extensively deformed into a deep cup-shaped body 14. The presence of the lacquer facilitates this operation as well as the use of a more serviceable brass composition. Electrodes drawn without a lacquer coating are made of 65–35 brass. These parts tend to crack and tear during the drawing operations and in some cases develop physical defects after a period of service. By use of the lacquer coating, the electrodes can be drawn satisfactorily from 85–15 brass, which has superior service characteristics.

It is necessary for the gold coating to deform with the brass in the drawing operation and to remain on the outer surface of the cup in a continuous, adherent coating. Any cracking or

flaking of the gold seriously detracts from the performance characteristics of the electrode in service. Because the gold is highly ductile it deforms readily with the brass under the machine dies and the lacquer affords protection against burnishing or removal of the gold during the forming process.

Cellulose nitrate lacquer is suitable for this purpose and good results can be secured with a solution of cellulose acetate or other cellulose derivative mixed with acetone to the proper consistency for easy application to the material. Also, the cellulose material can be applied in the form of an independent strip or sheet laid on the stock before the drawing operation.

It is necessary to remove all the lacquer from the plated surface of the completed electrodes because any residue will insulate portions of the gold and thereby reduce its effectiveness. To insure complete removal of the lacquer the parts are first immersed in a lacquer solvent, such as acetone, and subsequently subjected to the action of a supplementary cleaning process. In this secondary cleaning operation the electrodes are subjected to a circulating bath of solvent from which impurities are continuously removed by successive evaporation and condensation. Suitable equipment for this purpose is known commercially as Soxhlet apparatus and is described in catalogues issued by the Kimble Glass Company of Vineland, New Jersey, under their catalogue number 24,070. Other commercial cleaning methods can be used successfully and any process that will effectively and completely remove the lacquer is suitable for this purpose.

The production of parts by this method reduces the manufacturing cost and improves their service life. Use of the lacquer coating reduces the occurrence of defective parts during the manufacturing process and increases the service life of the part by facilitating the drawing of material having greater hardness and stiffness. The necessity for intermediate annealing of the metal between drawing operations, with consequent disturbance of the hardness and temper, is eliminated.

In the manufacture of parts similar to the transmitter electrode less handling is required and fewer defectives are produced. The layer of gold applied on the strip is more uniform than the plating on a formed body because a flat surface is presented uniformly to the plating electrodes. As a result, the minimum coating weight can be reduced on the assurance of uniform distribution. The gold deposit can be confined to the required surfaces because masking of the excluded areas is simply accomplished and the gold on the scrap material produced in forming the strip into articles is readily recovered by immersing the scrap in nitric acid which dissolves the brass and lacquer, leaving the gold in deposit.

Other advantages and objects of the methods described herein will be apparent and it is to be understood that the invention is limited only by the scope of the appended claims.

What is claimed is:

1. A process for manufacturing a plated cup-shaped article, comprising electrodepositing a coating on a metal strip, covering the plated strip with a cellulose derivative lacquer to protect the plating and provide lubrication during subsequent forming operations, forming the strip into said article, and removing the lacquer from the formed article.

2. A process for manufacturing a transmitter electrode, comprising electrodepositing a layer of contact metal on one face of a metal strip, mixing cellulose acetate with a suitable solvent, coating the plated strip with said mixture, forming the coated strip into the electrode, and finally removing the said mixture from the contact metal.

3. A method of manufacturing transmitter electrodes, comprising coating a strip of material with contact metal, covering the contact metal with a cellulose derivative lacquer to protect the contact metal and strip during subsequent distortion thereof, forming the strip into electrodes, and removing the lacquer from the formed electrodes.

4. A method of manufacturing transmitter electrodes, comprising the steps of applying gold to a strip of brass by electrodeposition, applying cellulose acetate over the gold, forming the composite strip into electrodes, and removing the cellulose acetate from the gold coated surface of the electrodes.

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