Dec. 22, 1959 C. C. POWERS 2,917,811

METHOD OF PRODUCING AN ELECTRODE STRUCTURE

Filed June 15, 1955

FIG.1.

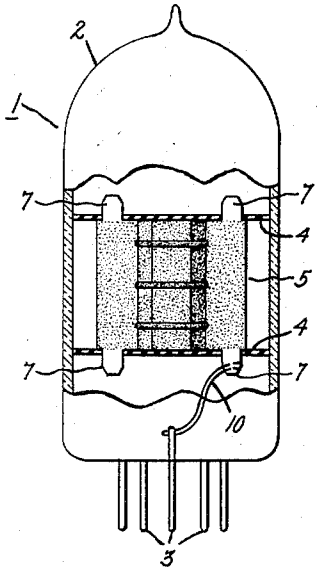


FIG.2.

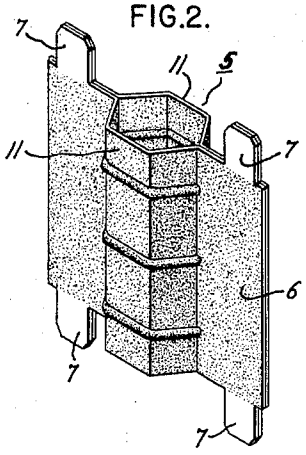


FIG.3.

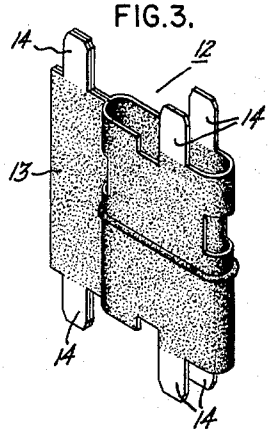
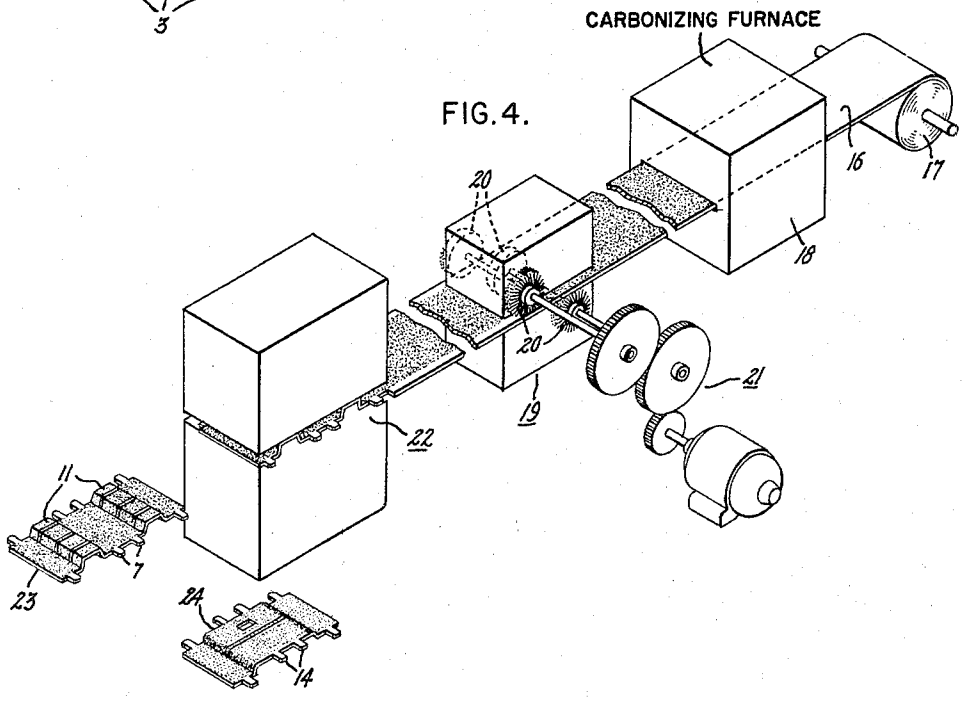


FIG.4.



INVENTOR:
CECILLO C. POWERS,

BY Nathan Kornfeld
HIS ATTORNEY.

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METHOD OF PRODUCING AN ELECTRODE STRUCTURE

Cecillo C. Powers, Owensboro, Ky., assignor to General Electric Company, a corporation of New York

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6 Claims. (Cl. 29—25.18)

My invention relates to electrode elements and pertains more particularly to an improved electrode structure and the method of producing such structure.

In electronic tubes and the like it is often desirable to treat the surfaces of elements therein as by coating with particular materials. For example, it is often desirable to carbonize or otherwise darken the surfaces of anodes for increasing heat radiation and decreasing secondary emission, thereby to increase the operating efficiency of such elements. It has been found, however, that the anodes, when carbonized or similarly treated, are not adapted for having satisfactory welds made thereto due to the presence of the coating material between the body material of the electrode and the members or elements to be welded thereto. Thus, it is difficult to make suitable electrical connections to such electrodes. Additionally, it has been found difficult satisfactorily to remove the coating material from portions of the electrodes to which it is desired to make welded connections.

Accordingly, the primary object of my invention is to provide a new and improved electrode structure adapted for facilitating the making of satisfactory electrical connections thereto.

Another object of my invention is to provide a new and improved method for producing electrode elements whereby the element when formed is adapted for having satisfactory electrical connections made thereto.

Still another object of my invention is to provide a new and improved electrode structure and method of producing such structure which facilitates and reduces the cost of manufacture and which insures satisfactory dependable welded connections thereto.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularly in the claims annexed to and forming part of this specification.

In carrying out the objects of my invention I feed material in strip form through means adapted for providing predetermined coated and uncoated portions on the material. Then the strip is fed into means for forming and shaping portions of the strip to provide blanks including tab portions located at the predetermined uncoated portions. Subsequently, the blanks can be bent to provide coated tubular or sleeve-like electrodes including bare tabs adapted for having other elements welded thereto.

For a better understanding of my invention, reference may be had to the accompanying drawing in which:

Fig. 1 is an elevational view of an electrical discharge device including an embodiment of my improved electrode structure;

Fig. 2 is an enlarged perspective illustration of one form of structure that may be produced in accordance with my invention;

Fig. 3 is an enlarged perspective view of another electrode structure that may be produced in accordance with my teachings; and

Fig. 4 is a schematic perspective illustration of means that may be utilized in practicing my method.

Referring to Fig. 1 I have shown in outline an electric discharge device generally designated **1** and including the usual envelope **2**, lead-in pins or prongs **3**, and spaced insulative support members **4**. Mounted between the support members **4** is an anode **5** constructed and produced in accordance with one form of my invention.

As seen in Fig. 2, the anode **5** is formed of a single blank of conductive sheet material such as nickel. The blank comprises a body portion generally designated **6** and a plurality of tab portions **7** disposed along both the upper and lower edges of the blank. As indicated by the stippling, the body portion **6** is carbonized or otherwise coated for increasing the operating efficiency of the structure as by increasing heat radiation and minimizing secondary electron emission. The tab portions **7** are bare or uncoated and cleaned. Thus, the tab portions **7**, in addition to being adapted for securing the anode **5** between the insulating support members **4**, are each adapted for having other elements, such as the lead **10** in Fig. 1, suitably electrically connected thereto as by welding. Due to the fact that each of the tabs is adapted for having a satisfactory weld made thereto, it is immaterial how the anode is mounted between the supports **4**. There will always be one of the tabs **7** in position for having the lead **10** welded thereto, thereby to provide a satisfactory electrical connection to the anode body.

As also seen in Fig. 2 each half of the body portion of the blank from which the anode **6** is formed includes an outwardly extending portion **11**. Thus, when the blank is folded in half or bent upon itself to bring the end tabs in juxtaposed positions in the manner shown, the portions **11** cooperate to provide a tubular or sleeve-like structure adapted for fitting about other electrode elements such as a cathode and one or more grids (not shown). Additionally, suitable means (not shown) are provided for securing the halves of the blank together to maintain the tubular configuration of the structure.

In Fig. 3 is illustrated another embodiment of my electrode structure generally designated **12**. This embodiment is also formed of a single blank of sheet material such as nickel and includes a body portion **13** which, as indicated by the stippling is carbonized or similarly coated for increasing heat radiation and minimizing secondary electron emission. The blank further includes a plurality of bare tab portions **14** located in spaced relation along both the upper and lower edges of the structure. As seen in Fig. 3 the blank from which the structure **12** is formed may be preformed so that when it is folded or the ends thereof are brought together to place the end tabs in juxtaposed positions the intermediate portion forms a substantially flat tubular or sleeve-like structure for being disposed about other electrode elements (not shown). The tabs **14** are adapted for extending through suitable insulative support structures, such as those designated **4** in Fig. 1. Additionally, the bare tabs **14** are such that a suitable electrical connection, such as a welded one, may be made to the body portion of the anode through any one of the tabs **14**.

The anode structures **5** and **12** may each be produced in the manner schematically illustrated in Fig. 4. This method includes providing the sheet material from which the structures are formed in an elongated strip **16** and preferably in a roll designated **17** in Fig. 4. From the roll **17** the strip **16** is fed into or passes through a carbonizing furnace generally designated **18** or any similar device for providing a desired coating on the strip. From the furnace **18** the strip **16** emerges carbonized or otherwise coated, as indicated by the stippling. Thereafter, the strip is fed through a buffing device generally

designated 19. The device 19 may comprise a plurality of buffing wheels suitably journalled in the device and situated and adapted for buffing the opposite side edges of each side of the strip, thereby to remove completely the previously applied coating material therefrom. The buffing wheels 20 may be driven by a suitable driving arrangement generally designated 21. Additionally, if desired, the device 19 may be adapted for removing completely the coating from one side of the strip 16.

After emerging from the buffing device 19 the strip 16, with the side edges bared or cleaned of the coating material, is directed between male and female dies of a stamping arrangement generally designated 22. The arrangement 22 may be adapted for forming blanks 23 which are adapted for being bent into the configuration illustrated in Fig. 2 or blanks 24 which are adapted for being bent to assume the configuration of the structure illustrated in Fig. 3. Other shapes and configurations can be employed as desired or required. Additionally, as clearly seen in Fig. 4, the carbonized strip 16 with the carbon coating removed from the side edges is so oriented as it enters the die structure 22 that when the structure 22 is operated it is effective for forming the body portions of the blanks from the coated or carbonized body portion of the strip and for forming the tab portions from the bared or cleaned edge portions of the strip. The blanks may be each cut off by the die arrangement 22 as it is thereby formed. Or, alternatively, the formed blanks may be left connected and rolled for easy shipment and severed upon arrival at a point of use. The individual blanks, after forming are folded in half to assume the desired anode configurations. Thereafter, the ends are suitably secured together and the structures are ready for assemblage into a tube structure in the manner shown in Fig. 1.

It will be seen that while I have shown my invention as applied to carbonized anodes, it is not limited to such structures. My invention is equally applicable to the provision of other electrode structures having other coatings and as, for example, thorium, nickel-oxide, sprayed radiating surfaces such as anodized graphite, nickel powder, etc. Additionally, it will be seen that my invention is applicable in the provision of composite surface elements other than electrodes.

While I have shown and described specific embodiments of my invention I do not desire my invention to be limited to the particular forms shown and described, and I intend by the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to scecure by Letters Patent of the United States is:

1. The method of producing electrode elements comprising the steps of applying a coating on a piece of conductive material, removing said coating from predetermined portions of said material, forming said material into a body portion and at least one tab portion so that said tab portion will be formed from one of said predetermined portions from which said coating has been removed.

2. The method of producing electrode elements comprising the steps of applying a coating on a piece of conductive material, removing said coating from the opposite edges of said material, forming said material into a body portion and oppositely extending tab portions so that said tab portions will be formed from said edges of said material from which said coating has been removed.

3. The method of producing electrode elements comprising the steps of coating a sheet of conductive material with carbon removing said carbon from predtetermined portions of said material, forming said material into a body portion and at least one tab portion so that said tab portion will be formed from one of said predetermined portions from which said carbon has been removed.

4. The method of producing electrode elements comprising the steps of coating a sheet of conductive material with carbon, removing said carbon from the opposite edges of said material, forming said material into a body portion and oppositely extending tab portions so that said tab portions will be formed from said edges of said material from which said carbon has been removed.

5. The method of producing electrode elements comprising the steps of coating a strip of nickel with carbon, buffing said carbon from predetermined portions of said strip, and cutting said strip into blanks each including a body portion formed from the carbon coated portion of said strip and at least one tab portion formed from one of said predetermined portions from which said carbon has been removed.

6. The method of producing electrode elements comprising the steps of coating a strip of nickel with carbon, buffing said carbon from the opposite edges of said strip and cutting said strip into blanks each including a body portion formed from the coated portion of said strip and a plurality of tab portions formed from said opposite edges from which said carbon has been removed, and bending said blanks to bring tab portions on opposite ends thereof into juxtaposed positions to provide a tubular element.

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