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MANUFACTURE OF ALTERNATING ELECTRIC CURRENT RECTIFIERS

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3 Claims. (Cl. 175—366)

This invention relates to the manufacture of alternating electric current rectifiers of the dry surface contact type comprising a body of metal having a compound of the metal formed directly thereon and more particularly rectifiers of the copper oxide type.

Rectifier elements of this character may be manufactured as has hitherto been proposed by heating metal blanks in a suitable atmosphere at a suitable temperature for a suitable period of time to form a compound of the metal thereon, as for example, by heating copper blanks in an oxidising atmosphere to form cuprous oxide on the surface of the metal, and then transferring the blanks immediately from the oxidising furnace to an annealing furnace maintained at a lower annealing temperature so as to cool the blanks to this lower temperature and then immediately, or after the blanks have been maintained at the annealing temperature for a predetermined relatively long period of time, removing the blanks from the annealing furnace and suddenly cooling or "quenching" them in cold water or a current of cold air.

According to the present invention, however, the blanks after being heated or subjected to the oxidising temperature as referred to hereinbefore are arranged to be cooled, by exposing them to cold air for instance, to a temperature intermediate the oxidising and annealing temperatures before being subjected to the annealing temperature, the intermediate temperature being preferably only a few degrees above the annealing temperature.

It is found that, by delaying the transfer of the oxidised blanks from the oxidising to the annealing furnace in this way, instead of immediately transferring the blanks from the oxidising to the annealing furnace as in previously known processes, the forward resistance of the rectifier elements is reduced without correspondingly reducing the reverse resistance, which as will be readily understood constitutes an important advantage.

In the case of copper oxide rectifiers the delay period required in transferring a normal or usual furnace charge of oxidised blanks from the oxidising to the annealing furnace may, for example, be about one minute, the subsequent annealing period prior to "quenching" being of normal duration, for instance ten minutes.

The reduction of the forward resistance thus obtained is similar to that which would be obtained by transferring the oxidised blanks immediately from the oxidising furnace to the annealing furnace and maintaining them as has hitherto been proposed at the annealing temperature for a relatively long period of time, for instance 30 minutes, but in this latter case the reverse resistance also would be correspondingly reduced which as will be evident is undesirable.

However by delaying the transfer for one minute as explained hereinbefore the reverse resistance of the elements is the same as it would have been if the oxidised blanks had been subjected to the annealing temperature for ten minutes without the intermediate delay and thus in accordance with the invention a reduction of the forward resistance is obtained without a corresponding undesirable reduction of the reverse resistance, it being understood that the reverse resistance is reduced progressively as the annealing period is increased.

Moreover by delaying the transfer from the oxidising to the annealing furnace in order to reduce the forward resistance in accordance with the invention a considerable reduction of the time required for the annealing process is effected as compared with the previously proposed process referred to in which the oxidised blanks had to be maintained in the annealing furnace for a relatively long period of time. Furthermore the delay between the oxidising and annealing processes facilitates the provision of a continuous furnace plant for the production of rectifier elements, as the isolation of the period of time required for oxidation from the period of time required for annealing by the delay period makes the manufacture cycle elastic, as either the oxidation time or the annealing time can easily be varied independently of the other.

It will be understood that the invention is not limited to the delay and annealing periods hereinbefore given only by way of example, these periods being capable of being varied to suit particular conditions or requirements.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. The method of manufacturing a copper oxide rectifier which consists in subjecting a copper blank to an oxidizing temperature to form an oxide layer thereon, removing the blank from the oxidizing temperature and exposing it to cold air for about one minute, and then subjecting the blank to an annealing temperature.

2. The method of manufacturing a copper oxide rectifier which consists in subjecting a copper blank to an oxidizing temperature to form an

oxide layer thereon, removing the blank from the oxidizing temperature and exposing it to cold air for about one minute, and then subjecting the blank to an annealing temperature for about ten minutes.

3. In the process of manufacturing a copper oxide rectifier wherein a copper blank is first oxidized by subjecting it to an oxidizing temperature in an oxidizing atmosphere and is subsequently annealed at a lower temperature, the step which consists in permitting the oxidized blank to cool in cold air just prior to annealing it for a time which is sufficient to cool it to a temperature only a few degrees above the annealing temperature.

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